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Regional Workshop in Khorog and Kashgar

Pastoralism and Rangeland Management in Mountain Areas in the Context of Climate and Global Change

Edited by Hermann Kreutzmann, Kishwar Abdulalishoev, Lu Zhaohui, Jürgen Richter

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

On behalf of
BMZ Federal Ministry for Economic Cooperation and Development

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Preface

The Regional Workshop on Pastoralism and Rangeland Management in Mountain Areas in the context of Climate and Global Change is part of a series of conferences that were held within InWEnt's[1] mountain development programme. In addition to international conferences the regional workshops address a specific topic and – as in this case – issues of trans-boundary relevance. Pastoralism and rangeland management does not stop at borders. Consequently, developments across boundaries are part of the debate among professional colleagues when nature protection, eco-tourism, climate and global change and cooperation among neighbours are concerned. For the second time after the Gilgit-Kashgar Conference in 2008 neighbouring provinces provided the venue for a regional workshop. Gorno-Badakhshan (GBAO) represents the prime pastoral region within the Eastern Pamirs of Tajikistan. The capital of GBAO Khorog was selected as the venue for the workshop as the focal point for political decision-making, biological and animal husbandry-related research as well as governmental and non-governmental development activities within the Pamirs of Tajikistan. Across the border to Xinjiang Uigur Autonomous Region within the Peoples Republic of China the Kashgar Prefecture provides access to the high pastures of the Western Kun Lun Shan and Pamirs. Kashgar hosted the second part of the conference where colleagues from China and Tajikistan met with international experts and professionals from neighbouring countries within the framework of InWEnt's mountain programme.

The challenges of climate and global change prominently featured in the conference deliberations. Transitions and transformations in the world of pastoralists were attributed to these strong impacts as well to the variegating social and political structures in respective countries. During the fieldtrip from Khorog across the Pamirs and Kulma Pass to the Kizil Su Kirgiz Autonomous Prefecture and Kashgar City all participants could experience the different experiences and policies related to pastoralism and rangeland management.

In this proceedings volume the keynotes and case studies are presented in order to reach a wider readership and community of practice for whom the results of group work, fieldtrip experiences and discussions are recorded in addition to provide easy access and future reference. Finally the workshop participants share their recommendations that are owned by the participants and based on group discussions and mutual exchanges. In order to maintain the expressions emphasized by the authors an homogenisation of economic, ethnic and technical terms was kept to a minimum. The authors of keynotes and papers are solely responsible for the contents and information presented.

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[1] Since 1 January 2011, InWEnt has become part of Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

The editors are grateful to the respective local organisers Mountain Societies Development Support Programme (MSDSP) and the Xinjiang Academy of Agricultural Sciences (XAAS) for amicable hospitality in both venues, for additional insight into the respective experiences during the fieldtrip and for all arrangements that contributed to a successful regional workshop. The results will be available in Chinese and in English language.

Hermann Kreutzmann, Kishwar Abdulalishoev,
Lu Zhaohui, Jürgen Richter

Welcome Address from His Excellency Isror Isrorov, Deputy Chairman GBAO

I am glad to welcome all guests at this highly elevated place on earth which is called *bam-e dunya*, the roof of the world. The Pamirs are situated within the gigantic Central Asian mountains and make up an area of 63.7 thousand km^2 (44.6 % of the territory of the Republic). Different landscape types are to be found in this zone: subtropical and alpine, eternal ice and sultry high deserts, where narrow valley space is close to towering mountain peaks. Here the greatest mountainous systems are meeting: Tian Shan, Hindukush, Kun Lun Shan, Pamirs and Karakoram.

The issue which will be discussed today is of great interest for the development of our region. Animal husbandry especially the development of sheep- and yak-breeding are highly connected to the utilisation of substantial areas for pasture. The improvement of the pastures will not only lead to the increase of livestock, but also benefitting wild animals such as Marco Polo sheep and wild goats. Moreover, the well-being of wildlife is related to tourism development and hunting which will bring high profits for the region.

According to official data there are 749,671 hectares of pasture lands from which 105,618 belong to the so-called reserve of national land, 18,912 hectares are bound to the forestry balance, 116,943 hectares are reserved as a special sanctuary zone, 1702 hectares are utilised for industries and roads, in addition the bulk of 506,216 hectares or 67% of the total area is part of our agricultural resources mainly used for pasture purposes. At the same time from the pasture lands which are part of agricultural enterprises 408,722 hectares are utilized by *dehqan* farmers, 272 hectares are reserved for personal use, 76,360 hectares are used by public agro-industrial enterprises of the region. With efficient use of all natural hay and pastures of the region it is possible to have 80,000 to 100,000 tons annual yield of fodder. At present, actual use of fodder from natural hay and pastures of the region is 55–60%.

Structural changes in agriculture in Tajikistan and in particular in GBAO have lead to an inefficient management of pastures. Small farmers rarely can afford to take their livestock to high summer pastures. Constant maintenance of the livestock in the spring, winter and autumn pastures cause pressure on fodder resources and consequently the pasture will loose its valuable fodder grasses and at the same time remote summer pastures will clutter up with bushes and will loose their fodder value as well.

The Tajik Government allocates different grants and loans for agricultural entrepreneurs in solving this issue. For a five-year-period since 2005 about 21,977,532

TJS were provided in the form of loans for the improvement of livestock-breeding. According to the government decree No. 542 from November 2, 2007 a project was developed for support of yak-breeding during 2008–2015. In future the provision, storage and sale of bloodstock should be safeguarded; the purchase of pedigree yaks will be supported with the aim of satisfying the needs of breeders irrespective of the type of farming/economy. Annually, for the development of yak-breeding there are allocated additional means for pedigree yaks and expansion of yak-breeding areas in other regions of Tajikistan. In an effort to receive funds from the Shanghai Cooperation Organization two projects were developed and proposed involving 16 agricultural projects from which were allocated long-term loans at the sum of 180,000 TJS. For the purpose of preventing uprooting *teresken* which is the main fodder of local livestock and wild hoofed animals in the Eastern Pamirs, there were allocated means for purchasing coal for the last four years by Ministry of Environment of GBAO.

Further sustainable use of pastures depends on system approach to this issue therefore, I think conducting such workshop contributes new suggestions for improving this field of study.

For successful achievement of the purpose of the workshop I wish all participants success and productive work.

Thank you for your attention!

Welcome Address from Jürgen Richter InWEnt[2]

Khorog and Kashgar, the Pamirs and the Kun Lun Shan, both names and mountain ranges have something in common and represent something different. Khorog is the capital of Gorno-Badkhshan Oblast, Tajikistan's mountainous eastern province. To the world Khorog became famous and renowned when the first road feasible for motor car traffic across a major mountain range reached here in 1935. The memorial reminding us of this break-through event can be visited here in Khorog. The Pamir Highway became the epitome of mountain communication. The first road crossing the mighty Pamirs connected Osh and Khorog for regular traffic via 4600m Akbaital Pass. The ancient oasis of Kashgar refers – in the first place – to the romantic allures of the Silk Road heritage. It was the commercial centre for nomads utilising surrounding pastures and rangelands. The nexus of oasis and its environs is characteristic for survival strategies in the Central Asian mountains, steppes and desert regions. Since then Kashgar has significantly transformed and experienced many changes, revolutions and reforms. From an oasis town with an economy based on irrigated crop and cotton cultivation as well as business and trading functions Kashgar has mutated into a bustling modern city in Northwestern China. Kashgar's face is changing at a fast pace.

Both – Khorog and Kashgar – are depicting one of the prime features of InWEnt's mountain development programme: building bridges for trans-border communication and exchange. From Khorog bridges cross the divide that separated two regions that had a lot in common before boundary-making in the late 19th century closed borders. Afghanistan and Tajikistan have gone through these experiences. Kashgar has developed to become a distribution and market centre for goods to neighbouring countries such as Kyrgyzstan, Tajikistan and Pakistan. Towns are important in as much as urban areas can only survive in symbiosis with its hinterland. Consequently, a second pillar of attention in InWEnt's mountain programme is devoted to rangeland management and nature preservation. Our gathering here is focussing on this aspect and the challenges climate and global change pose for the system.

In its mountain programme InWEnt aims at convening experts and colleagues for mutual exchange. Professionals from different fields, development practitioners and scientists are invited to conferences to present their views and share their experiences. These individuals live and work in the Pamirs, Hindukush, Karakoram, Himalaya and Kun Lun Shan.

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[2] Since 1 January 2011, InWEnt has become part of Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

Therefore lessons-learnt should be adopted and regional specifications need to be accounted for. InWEnt has selected a multi-facetted approach for its mountain development programme in Asia. First of all, partners who share similar goals and objectives are of fundamental importance. With our partners in China, Nepal, Pakistan and Tajikistan we have found such a common cause. The combination of methodological training, input-relevant exposure and practice has proven to be a straight-forward approach to contribute to mountain development in our partner countries.

More than a decade ago InWEnt began to organize international conferences with mountain development focus in the region. In the beginning these meetings aimed at assembling a community of knowledge. Professional colleagues from academia, decision-making and development practice were invited to articulate their challenges and indicate their concepts for shaping the immediate future. The attempt was made to provide a platform that allowed sharing experiences and formulating strategies. Right from its inception these conferences were well received and further demand for topic-specific gatherings grew. A sequence of conferences devoted to special themes followed in Chengdu, Dushanbe, Lhasa, Kathmandu, Gilgit and Kashgar, and of course in Feldafing, the centre of InWEnt's mountain development programme. It became obvious that not only globalization and climate change had created common themes, but that neighbouring mountain regions have been tied with each other since ages. Common issues exist and point at constraints and challenges in the framework of ecological and societal change, protection of culture and nature, sustainable development for future generations.

InWEnt's stimulation is directed to human capacity building for the management of socio-economic change. Consequently, the second pillar of our commitment is the international leadership training (ILT). In two consecutive, one-year-long ILT courses we have trained 45 highly-motivated and pre-selected promising professionals from China, Nepal, Pakistan, and Tajikistan. The third batch of participants has been selected and will start their course by November 2010.

The feed-back of our alumni and participants is encouraging, a community of knowledge-sharing is in the making. The spirit of the Feldafing training is to take lessons-learnt from Europe to Asia. Exposure to real life experiences in the Alps, methodological and theme-specific training focussing on change management by expert trainers and mutual exchange within a learning community has created the platform on which we try to expose all participants to local and regional conditions and to foster research, planning and practice. Transfer of knowledge is the key concept in the ILT process that has created a community of communication among like-minded professionals. These tools for designing the future are augmented by a set of regional workshops and training courses that incorporate local and international experience. Alumni from the ILT are seen as brokers for professional communication.

During our conference in Khorog and Kashgar we will have a number of presentations and interventions by former ILT participants. This is a promising sign and supporting the aim of InWEnt's mountain programme. More young professionals and experts need to take a leading role in the management of change in demanding times of financial crises, climate and social change. Development practice and decision-making are facing significant challenges for a sustainable future in mountain regions.

Therefore I wish the joint Khorog and Kashgar regional workshop on "Pastoralism and Rangeland Management in Mountain Areas in the Context of Climate and Global Change" new insights and fruitful discussions. Pastoralism is not solely an academic issue; pastoralism is the daily life experience of herders and their households. The two locations of our workshop will be connected by a fieldtrip during which all participants should get sufficient exposure to the challenges and frame conditions of pastoral life in the Pamirs, to different approaches towards animal husbandry and rangeland management in neighbouring countries and to the importance of pastoralism for the utilisation of a valuable though fragile resource that makes this part of the world so unique. Already Marco Polo realised while traversing the Pamirs that the natural pastures here produce valuable livestock for sustenance and marketing. Since Marco Polo the world has significantly changed. To understand these changes and their importance for the designing of our common future is our goal. Let us start the workshop with sincere thanks to the representatives of our programme partner institutions MSDSP and the Xinjiang Academy of Agricultural Sciences as well as our colleagues from the CCD-GTZ programme here in Khorog for their strong support in the preparation of this conference!

Jürgen Richter

Abbreviations and Acronyms

ADAM	Adaptation and Mitigation Strategies: Supporting European Climate Policy’ Project
ADB	Asian Development Bank
AKDN	Aga Khan Development Network
AKF	Aga Khan Foundation
AKRSP	Aga Khan Rural Support Programme
CBNRM	Community Based Natural Resource Management
CBO	Community Based Organisation
CBSG	Community Based Savings Group
CCF	Climate Change Fund
CDE	Centre for Development and Environment
CDM	Clean Development Mechanism
CFU	Carbon Finance Unit
CIF	Climate Investment Fund
CKNP	Central Karakoram National Park
CMI	Carbon Market Initiative
CO^2	Carbon Dioxide
CPC	Communist Party of China
CSO	Civil Society Organization
CTF	Clean Technology Fund
DDB	Dairy Development Board
DDC	District Development Committee
DED	German Development Service
DEWA	Division of Early Warning and Assessment
DMC	Developing Member Countries
EEI	Energy Efficiency Initiative
EGS	Environmental Goods and Services
EIA	Environmental Impact Assessment
EU	European Union
FAO	Food & Agricultural Organization
FFO	Federal Foreign Office
FGD	Focus Group Discussion
GB	Gilgit-Baltistan
GBAO	Gorno Badakhshan Autonomous Oblast
GBC	Gilgit-Baltistan and Chitral
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GHG	Green House Gas

GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
GTZ	Deutsche Gesellschaft für technische Zusammenarbeit (GTZ) GmbH
HKH	Hindu Kush-Himalaya
HKKH	Hindukush, Karakoram and Himalayas
ICARDA	International Center for Agricultural Research in the Dry Areas
ICIMOD	International Centre for Integrated Mountain Development
ICT	Information and Communications Technology
IFAD	International Fund for Agricultural Development
InWEnt	Capacity Building International Germany
IPCC	Intergovernmental Panel on Climate Change
IUCN	The World Conservation Union
JFM	Joint Forestry Management
K-K	Kizilsu Kirghiz Autonomous Prefecture
KKH	Karakoram Highway
KNP	Khunjerab National Park
KPK	Khyber Pakhtunkhwa
LSO	Local Support Organization
MDG	Millennium Development Goals
MIGA	Multilateral Investment Guarantee Agency
M2M	Methane to Market’ Partnership
MSDSP	Mountain Societies Development Support Programme
Mt	Metric ton
NAPA	National Adaptation Programs for Action
NARS	National Agricultural Research Systems
NASSD	Northern Areas Strategy for Sustainable Development
NCCR	National Centres of Competence in Research
NCVST	Nepal Climate Vulnerability Study Team
NGO	Non-governmental Organisation
PA	Protected Areas
PALM	Pamir Alay Sustainable Land Management
PMAC	Programme for Mountain Area Conservation
R & D	Research and Development
REDD	Reducing Emissions from Deforestation and Forest Degradation
REN	Renewable Energy
SEG	Scientific Expert Group on Climate Change
TAR	Tibet Autonomous Region
TJS	Somoni, national currency of Tajikistan
TP	Tibetan Plateau
UCA	University of Central Asia
UK	United Kingdom

UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCC	United Nations Framework Convention on Climate Change
UNFPA	United Nations Population Fund
USD	US Dollars
VO	Village Organization
WB	World Bank
WO	Women Organization
WOCAT	World Overview of Conservation Approaches and Technologies
WWF	World Wide Fund for Nature
XAAS	Xinjiang Academy of Agricultural Sciences
XJ	Xinjiang
ZELF	Centre for Development Studies, Institute of Geographic Sciences, Freie Universitaet of Berlin, Germany

››› 1 Objectives and Structure of the Regional Workshop

Kishwar Abdulalishoev[3]

1.1 Objectives of the Workshop

Four objectives were formulated prior to the workshop. They formed the basis for the selection of participants and acted as guiding principles for the procedures during the conference:

1. Contribute to a deeper understanding amongst participants of the current situation in pastoralism and rangeland management in Central Asian mountain areas
2. Identify change processes that effect the sustainable livelihood of pastoral communities
3. Share experiences with coping strategies that are applied in mountain areas
4. Identify (and recommend) factors that contribute to resilience of pastoral systems and communities.

In addition, these formulated objectives fit in well with the overall objectives of InWEnt's mountain development programme.

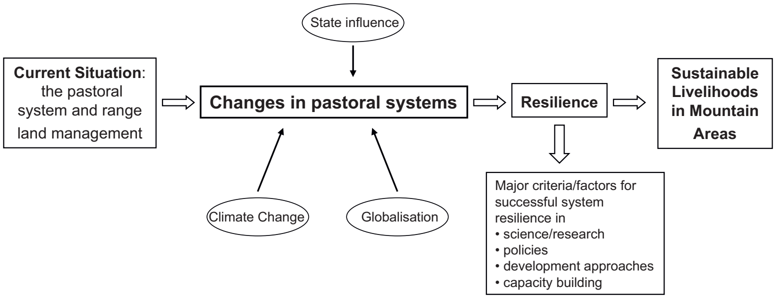
State influence
Current Situation: the pastoral system and range land management
Changes in pastoral systems
Resilience
Sustainable Livelihoods in Mountain Areas
Climate Change
Globalisation
Major criteria/factors for successful system resilience in
• science/research
• policies
• development approaches
• capacity building

Figure 1: Comprehensive structure and logic of the workshop

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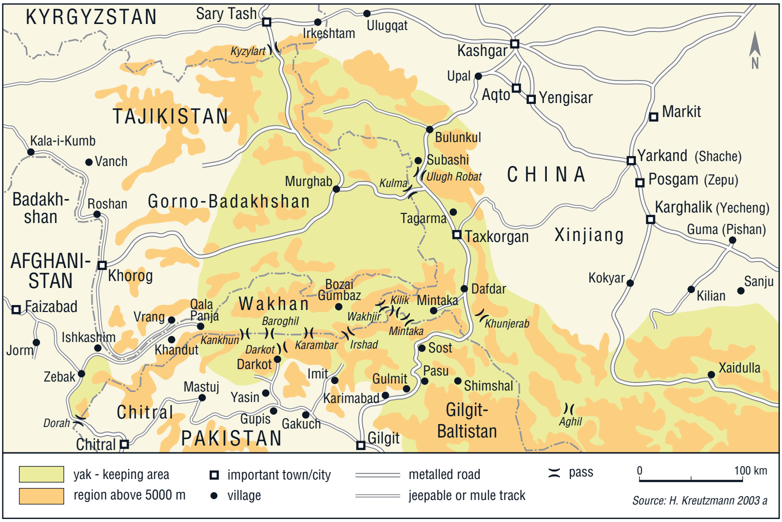
[3] General Manager MSDSP Khorog.

1.2 Structure of the Workshop

The opening of workshop will be followed by a one and a half day conference-style dialogue event to introduce relevant themes and concepts in keynote papers and case studies, share experiences and set the stage for an understanding and analysis of pastoral systems and rangeland management in different settings. This will lead to a cross-border dialogue on climate change and environmental adaptation, pastoral communities and their socio-economic transition, and the policies, actors and programmes that mitigate the effects of climate and global change



Source: H. Kreutzmann 2003 a

Figure 2: The study area and the route from Khorog to Kashgar

The second part of the workshop will consist of one and half days of exposure to GTZ and MSDSP projects in the Western Pamirs. The field experiences will give the opportunity to assess the achievements reached by NGO activities in the fields of combating desertification and promoting rural development in the aftermath of a transformation from a central command economy to decentralised activities with a high share of private enterprises. The second part of the field exposure will be organised along the Pamirian traverse from Khorog to Kashgar. In Ishkashim District combined mountain agriculture with a growing share of pastoral activities by gaining altitude will be in focus. Reaching Murghab District the dominant activities in mountain pastoralism as the prime strategy to utilise natural resources and rangelands will pose an interesting example of state activities and private enterprises in contrast to the Chinese approach that emphasizes on proper planning and state-led modernisation programmes for the uplift of rural mountain communities. The Kulma Pass functions as the international border between the two neighbours and introduces the pastoral activities in Aqto County. Various project sites (pastoral communities, rangeland management, additional income sources, etc.) will be visited from Khorog in Tajikistan on route to Kashgar in Xinjiang in order to allow for a comparison of experiences, recent developments and planning arrangements.

The theoretical background and exposure to the field will form the basis for an analysis of the current situation, the formulation of findings (incl. best practices) and identifying factors that contribute to resilience of pastoral systems during the third part of the workshop which will take place in Kashgar.

››› 2 Central Asian Pastoralism in the Context of Climate and Global Change

2.1 Climate Change in the Hindukush-Karakoram-Himalaya Mountains – Implications for Livelihoods of Mountain Societies

Madhav Karki[4] and Yi Shaoliang[5]

Abstract

Hindu Kush Himalayan (HKH) Mountain ecosystems are among those that are most susceptible to climate change. The maintenance of the HKH region's ecosystem services, especially fresh water and biodiversity will be the key to ensure supply of multiple livelihood goods and services to the people living upstream and downstream. Climatic warming has been impacting HKH mountain ecosystems, especially high elevation biota such as range and pasture lands. The data collected from the eastern Himalayas and Tibetan plateau show that there is a definite warming trend at higher altitudes and that areas at altitudes above 4,000m seem to be experiencing the greatest warming trend. The warming trend observed ranges from 0.01 to 0.060°C/yr and the annual mean tempera-

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[4] Deputy Director General and Natural Resources Management Specialist, ICIMOD.

[5] Rangeland Management Specialist, ICIMOD. Both authors acknowledge support and contributions from Nakul Chettri, Arun Shrestha, Eklabya Sharma, and the Climate Adaptation and Resilience Enhancement (CARE) group in ICIMOD.

ture rise is expected to reach 2.9°C by the middle of the century. Such changes often result in ecosystem changes such as water resources shortage due to rapid melting of glaciers and permafrost, rise in extreme events, decrease in biodiversity, fragmented vegetation, and shifts in vegetation pattern, more natural disasters and overall degradation of natural resources and environment. At the same time, mountain communities are often among the poorest and lack of adequate resources for adaptation and climate-induced disasters and resources decline often put mountain peoples deep into poverty trap. The implications are that climate change presents major new challenges and some opportunities to both the ecosystem management and livelihoods development processes in the region. Rapidly increasing onset events and impacts demands a major shift to the way the critical ecosystem services including rangelands, biodiversity and forest resources are managed. While the rampant poverty in the high lands require continuation of economic growth, the type of resource management regimes that needs to be incorporated in the measures to build resilience and adaptation to the impacts of climate change is not known. Strategies to enhance the adaptive capacity and increase the resilience of mountain communities in the context of climate change could focus on raising public awareness, promoting policy dialogue and policy reforms, promoting sustainable adaptive practices, developing disaster reduction measures, diversifying livelihood options, sharing knowledge and strengthening regional cooperation. Mitigation and adaptation programmes that support development investments with climate change co-benefits should be initiated for maintaining and enhancing ecosystem services in the global mountain systems which provide fresh water and climate regulation services for billions of people living downstream.

1 Introduction

"Himalayan climate impacts 'cannot be generalised'" was the recent headline in the BBC News.

Appa Sherpa, who has climbed Everest a record number of times, said recently that he had seen fresh water at the height of above 8,000m on Everest." I was shocked to see fresh water at that altitude, where I had seen nothing but snow and ice before," he said on his return last month from his 19th climb to the highest peak.

A recent gathering of water experts expressed `serious concern for paucity of climate data' in Himalayan mountain regions, and warned of `..a risk of economic collapse of several mountain communities." These statements reflect that climate change in the Himalayan Mountains is a complex issue.

Mountains are important sources of water, energy, minerals, forest and agricultural products and areas of recreation. They are storehouses of biological diversity, home to endangered species and an essential part of the global ecosystem (UN 1992). Hindu Kush-Himalayan (HKH) Region stretches over 3500 km from east to west, covering either whole or partial north Myanmar, west China, Bhutan, Bangladesh, India, Nepal, Pakistan and Afghanistan. It is home to the world's highest mountain peaks and plateaus. These giant mountain ranges themselves are important in the formation and regulation of the monsoons. Ten major rivers of Asia, including Yangtze River, Mekong, Ganges and Indus, have their originating places in the HKH. The region includes all or part of four global biodiversity hotspots, 330 important bird areas, two mega-diversity countries (India and China), and 60 eco-regions of which 12 are global 200 eco-regions. The region directly provides essential ecosystem services to more than 210 million mountain people, and indirectly to 1.3 billion people living downstream. The river basins are an important source of water, food and energy. The state of a HKH region's ecosystem services, especially biodiversity is a key to a number of ecosystem goods and services from which people for centuries have been drawing multiple benefits.

However, as with mountains in other parts of the world, mountains in HKH are also very susceptible to climate change. Global warming trends in the Himalayan region have been higher than the world average. The region has already been experiencing some of the worst negative consequences of climate variability and resultant disasters in recent years in terms of floods and droughts. Extreme weather events such as high intensity rainfall and temperature have become more frequent and severe. Weather patterns are becoming more unpredictable and the cycle of drought and floods are more frequent. The region as a whole is facing serious environmental and developmental challenges.

At the same time, countries in the HKH region belong to either the Least Developed Countries (e.g., Afghanistan, Bangladesh) or Lower Middle Income Countries (e.g. China and India)(UNDP 2009,) and have very limited capacity to adapt to climate change and cope with related negative consequences. Mountain communities in these countries are especially vulnerable since most of the inhabitants are much poorer than the national average and are regarded as poverty-stricken even by the respective national poverty line which is quite below the international standards.

This paper intends to give a quick review of the climate change facts and trends in the HKH Mountains and their impacts on the ecosystems and the livelihoods of the mountain societies especially the pastoral communities.

2 Trends of Climate Change in the HKH region

2.1 Rising temperatures

The rate of warming in the HKH region is significantly higher than the global average with great spatial and temporal variations. In the eastern Himalayan region including Nepal, Bhutan, Northeast India, North Myanmar, South Tibet and Northwest Yunnan, from 1977 to 2000, average annual temperature increased by 0.01°C in the foothills, 0.02°C in the middle mountains and 0.04°C in the higher Himalayas (Tsering et al. 2010). In the Western Himalayas and the plains of the Ganges basin annual mean temperature increased by 0.01–0.03°C over the past 25 years (Shrestha 2009). Data from nearly 100 stations across the Tibetan Plateau (TP) indicated that in the past 30–40 years, the linear rates of temperature increases over the Tibetan Plateau are about 0.016°C/year for the annual mean and 0.032°C/year for the winter mean, which exceed those for the Northern Hemisphere and the same latitudinal zone in the same period (Wei et al. 2003; Liu and Chen 2000; Zhou 2008)and are also significantly higher than the global average. Spatially, there is a strong upward trend in the central, eastern and northwestern Tibetan Plateau, while in the southwestern Tibetan Plateau there is only a weak warming trend. In Qinghai Province, annual mean temperature increased by a rate of 1.5°C between 1961 and 2006 (Qinghai People's Government 2008) and the decadal increase in annual temperature was 0.24°C in the farming areas of the east, 0.34°C around the Qinghai Lake area, 0.34°C in the source areas of Yangtze, Yellow and Mekong Rivers and up to 0.44°C in the Tsaidam Basin. There is also a tendency for the warming trends to increase with elevation in the Tibetan Plateau and its surrounding areas (Liu & Chen 2000).

There is a temporal variation in temperature rise. Wei et al. (2003) analyzed the weather data from 72 stations across Tibet and discovered that from 1962 to 1999 temperature rise in most of the TP was about 0.2–0.3°C/decade in winter and spring but only 0.1–0.2°C/decade in summer and autumn time. Yao (2002) also reached a similar conclusion when analyzing the weather data from 15 stations during 1969 and 1998. On daily basis, temperature rise was greater at night than during the day. He et al. (2005) pointed out an annual mean temperature change between 0.01°C/year and 0.04°C/year based on an analysis of weather data from a period of 40 years from 1960s to 1990s.

Similar trends were observed in the higher elevations of Himalayas(Shrestha and Devkota 2010; Tsering et al. 2010)where the highest rate of warming is occurring in winter and lower or even cooling trends were observed in summer. An average temperature rise of 0.06°C/year from 1975 to 2006 has been recorded in Nepal (Shrestha 2009). Findings of a recent study on the climate change scenario in Nepal (NCVST 2009) make the vulnerability scenario rather alarming.

2.2 Precipitation

Precipitation changes have been quite variable and did not show consistent trends across the region. Climate change will change the time and intensity of monsoon, the way mountain range intercept water and cause total failure of monsoon (Beniston 2003). Even though the total monsoonal rainfall did not show significant change in India and Nepal, but there are signs of changes in the dates of onset and retreat of the monsoons as well as the number and frequency of extreme precipitation events, although more analysis is still needed to confirm this (Shrestha 2009). In Tibet Plateau, there is a slight increase in precipitation over the past 40–50 years (Zhou et al. 2008; Qinghai People's Government 2008; Wei et al. 2003; Liu & Chen 2000), but with a significant spatial and temporal variation. From 1961 to 2006, annual precipitation in Qinghai Province increased by roughly 1mm/year. Again, changes in precipitation are not consistent across the region and the year. In the Tsaidam Basin, there is a decadal increase of 5.6mm while in the farming areas rainfall decreased by 5.2mm per decade. By seasonal distribution, most of the increase of rainfall occurred in winter and spring (Qinghai People's Government 2008).

2.3 The occurrence of extreme climatic events

In recent decades, there has been a significant increase in the frequency and intensity of extreme climatic events such as drought, heat wave, cold spell, heavy rainfall, blizzards, heavy snow and storms in the HKH region. Very recent cases include the mega-scale devastating floods that are still beleaguering much part of Pakistan, the heavy rainfall caused by the cloudburst in Ladakh of India and the prolonged parching drought in Yunnan of China. In the Pakistan case, the floods were triggered by heavy rainfall in north Pakistan where in normal years most of the rainfall was shed during winter seasons. In the Indian case, the annual rainfall in the affected area hardly exceeded 200mm. In Afghanistan, a severe drought lasted from 2001 to 2006, which caused the death of millions of domestic animals. In Qinghai Province on Tibet Plateau, from 1997 to 2006, thunder-storm days increased by 3.2days per year.

2.4 Future scenario

There are quite some projections for the future scenarios of climate change in the HKH. One modelling predicted that by 2080s, the mean annual temperature change for all of the eastern Himalayas is shown to be in the range of +2.9 to 4.3°C and the mean annual precipitation change in the range of 13–34% (Tsering et al. 2010). Indian Institute of Tropical Meteorology (IITM) study suggests that there will be a decrease in monsoon precipitation of up to 20% by the end of the century in most parts of south-eastern Afghanistan, the southern and eastern Tibetan Plateau and the central Himalayan range and an increases in the range of 20–30% for the western Himalayas and Kunlun and Tienshan ranges. All areas of South Asia are projected to warm by at least 1°C by the end of the century. A large part of Nepal Himalayas, Himachal Pradesh, and the northern Tibetan Plateau could experience a warming of 3.5–4°C (Shrestha 2009). It is also predicted that in Qinghai annual mean temperature will increase by 2.2–2.6°C by 2030 and annual precipitation will increase by 5–7% by 2050. Again, changes will be more drastic with increase in elevation. Global Circulation Model (GCM) projections indicate that the average temperature increase in Nepal by the 2030s will range from 0.5 to 2.0°C with a multi-model mean of 1.4°C. By the 2090s, the increase will be from 3.0 to 6.3°C, with a multi-model mean of 4.7°C. The regional differences will be rather minimal.

The same model projects a wide range of precipitation changes, especially during the monsoon: precipitation could range from 14% less to 40% more by the 2030s and from 52% less to 135% more by the 2090s (ICIMOD 2009).

3 Climate-driven Environmental Changes in HKH Mountains

Mountain environments represent complex ecosystems that are often fragile and highly susceptible to climate change. This paper will focus mainly the following aspects of climate-driven environmental changes in the HKH mountains:(1) hydrological cycles and water resources; (2) decrease in biodiversity and shift in vegetation patterns; (3) increased frequency and intensity of natural disasters; and (4) degradation of resources and environment.

3.1 Hydrological cycles and water resources

Changes in climate will cause changes in hydrological cycles and the availability of water resources. A warming climate will enhance the hydrological cycle, which often implies higher rates of evaporation and a greater proportion of liquid to solid precipitation. As warming progresses in the future, regions where snowfall is the current norm will increasingly experience precipitation in the form of rain. Changes in the hydrological cycle may significantly change precipitation patterns leading to changes in river runoff and ultimately affecting hydrology and nutrient cycles along the river basins, including agricultural productivity and human wellbeing. Such changes also imply a different frequency of flood and drought episode (Beniston 2003). Mountains in the HKH region have the largest store of liquid water in the form of snow and ice on earth outside the polar regions. These snow and ice in mountain glaciers are a key component of the hydrological cycle in the region and the seasonal character and amount of runoff from these glaciers is closely linked to local cryospheric process. These glaciers are very sensitive to temperature and precipitation and their behaviour provides some of the clearest evidence of atmospheric warming and changes in the precipitation regime. Since in the HKH Mountains the snow-pack is often close to its melting point, it responds rapidly to apparently minor changes in temperature.

As is previously mentioned, climate change may change the time and intensity of monsoon, alter the way maintain range intercept water and cause failure of monsoon. HKH is aptly called the Water Tower of Asia. Most of the major rivers in Asia (such as the Indus, the Ganges, the Yangtze, the Yellow and Mekong rivers) have their origins in the mountains of HKH. These rivers have a significant proportion of the flow from glacier melt. For example, glacier melt accounts for up to 50% of the river flow of the Indus and the Tarim River (Erikson et al. 2009). Climate change will have significant impact on future water resources in the HKH region and beyond since climate change will affect the amount and seasonal distribution of water supply from the mountain glaciers and snow-packs.

Shifts in snow-pack duration and amount as a consequence of sustained changes in climate will be crucial factors in water availability for hydrological basins. For every degree centigrade increase in temperature, the snowline will rise by about 150m. It is predicted that if global warning scenarios in the range of 2–4°C occur, 30–50% of existing mountain glacier mass could disappear (Fitzharris et al. 1996; Haeberli, 1995). Shrinking glaciers will lead to changes in the hydrological response of certain regions compared to today; as glaciers melt rapidly, they will provide enhanced run-off, but as the ice mass diminishes, the runoff will wane.

Despite the recent controversy over the accuracy of the IPCC Annual Report No. 4's prediction of glacier melting in the Himalayas, there is consensus on the changes in nature of ice cover in the Himalayas (including the Tibetan plateau). In general, the majority of Himalayan glaciers are shrinking in area and thickness and the extent and nature of shrinkage has not changed significantly over the last 100 years in many large glaciers (UNEP 2009). However, the nature of changes in glaciers are varied and complex with some glaciers exhibiting changes in length in an observational relationship to area and mass while some have changed in length with little change in mass and yet others show changes in thickness but not length. Glacier behaviour varies across the region with higher retreat rates recorded in the eastern Himalayas (UNEP 2009).

3.2 Decrease in mountain biodiversity and shifts in vegetation patterns

Mountains in HKH region harbour many of the globally important biodiversity hotspots and eco-regions. Mountains are also most susceptible to and exhibit a greater degree of climate change which will without doubt impact mountain biodiversity in a variety of ways.

Plant life at high elevation is very sensitive to temperature change (Koerner 2003). Climatic warming will cause an upward movement of alpine plant communities which could result an eventual distinction of some local endemic species due to limited space for further migration along the altitudes (McArthur 1972; Peters and Darling 1985). It will also change the species composition of present alpine vegetation with more invasive or frontier species and a shift in dominant species (Huntley 1991). In the Eastern Himalayan region, some of the major observed and projected impacts of climate change on biodiversity include loss and fragmentation of habitat, vertical species migration and extinction, decrease in fish species in rivers, reduced forest biodiversity, peculiar tendencies in pheno-phases, reduced agro-biodiversity, loss of species, increase in exotic, invasive, noxious weeds, high species mortality and etc. (Tsering et al. 2010).

Climate change will also cause shifts in geographical pattern of vegetation distribution. The location and area of natural vegetation zones of the Tibet Plateau will change substantially under projected climate change scenarios. It is predicted that that the climate change would cause a large reduction in the temperate desert, alpine steppe, desert, and ice/polar desert, a large increase in the cold-temperate conifer forest, temperate shrublands/meadows and temperate steppe, and a general northwestern shift of all vegetation zones (Ni 2000). Climate change may also result in a shift of the boundary of the farming-pastoral transition zone across the region, which may increase grassland areas and provide more favourable conditions for livestock production. However, the transition area of the farming-pastoral region is also an area of potential desertification, which will be aggravated by more frequent and prolonged droughts. At high altitudes and latitudes, crop yields should increase because of reductions in frost and cold damage. Irrigated lowland agriculture, found in all of the large basins receiving their runoff from the Hindu Kush-Himalayan system, is likely to suffer from lack of water in the dry seasons (Erikson et al. 2009).

HKH region has the most spectacular timberline landscape on the globe. Climatic warming will cause the upward movement of timberline and ecological zones. This may eventually squeeze the habitat of many alpine communities and cause the extinction of many endemic species since they are living in isolated environment.

3.3 Increased vulnerability and exposure to natural hazards

Globally, there is a constant increase of climate-related disasters in the recent half century. The HKH region is experiencing similar trend but with higher frequency and increased ferocity. Compared to low land plains, mountains are even more prone to natural hazards and disasters such as flash floods, landslides, gust winds, blizzards, heavy snow, floods, mud and debris flow and glacial outburst floods and drought. Certain types of disasters, e.g. landslides, glacial lake outburst floods (GLOFs), gust winds and flash floods, are unique to mountainous areas. Mountains in HKH region are among the most vulnerable to natural disasters. Recent large-scale events that caused deaths in thousands and incurred huge property damages include the Indus river floods in Pakistan and Ladakh Flash Flood of India and Zhouqu Landslide of China in 2010. Each year, countless numbers of minor disasters occur in the mountains of HKH that are disrupting the lives of the mountain communities.

3.4 Degradation of natural resources and mountain environment

Climate change and human activities combined to have caused widespread resources and environmental degradation in the HKH region, which has decreased the capacity of the mountain ecosystem to provide adequate ecosystem services and reduced the resilience of the mountain social-ecological systems. In eastern Himalayas, observed and projected resources and environmental degradation include wetlands riverine ecosystem degradation, loss or degradation of natural scenic beauty, change in the utility values of alpine and subalpine meadows, increase in exotic, invasive and noxious weeds especially on rangelands and pastures, shifts from wetlands to terrestrial ecosystems, shrinkage of wetlands, drying and desertification of alpine zones, increase in forest fires, soil fertility loss and degradation (Tsering et al. 2010).

Climate change has drastically affected the availability and quality of water resources as is manifested in shrinkage of lakes, decrease in river flows, glacial retreats, rise of snowlines, and degradation of wetlands, all common in HKH region. Accelerated glacial melt as a result of climate warming has caused seasonal shortage of water resources in many mountain areas of HKH. Studies carried out by ICIMOD (unpublished) in Nepal, Pakistan, Afghanistan and Bhutan all pointed to the facts that pastoralists have to relocate their settlements or change their migration routes due to the disappearances of water points in the rangeland areas.

Land resources, especially farming lands, in the mountain areas are often precious assets for human inhabitants, especially for those living in the valleys of the major rivers. However, such resources are frequently destroyed by climate-induced natural disasters such as floods, landslides, earthquakes and droughts, which often make local environment uninhabitable and forces relocation of the settlement areas of mountain societies.

Rangelands account for over 60% of the total land area of HKH and most of the rangelands were in the high elevation or mountainous areas. However, rangeland degradation and desertification in the region is severe all the way from west China to Pakistan and Afghanistan and shows an accelerating pace. In China, it is reported that in the last 10 years the area degraded has risen from 55% to over 90% (Lu et al. 2006). A recent survey revealed that 91% of temperate typical steppe and desert steppe were degraded but the temperate meadow rangeland was not so severely affected. Much effort has been focusing on the anthropogenic factors, but there is also an increasing understanding of the roles of climatic factors in the process (Han 2008; Ho 2001; Wily 2004, Wang et al. 2004).

In regions where climatic change may lead to warmer and dryer conditions (such as Western Himalayas, Tibet Plateau, Xinjiang and other regions in Central Asia), mountain vegetation could suffer the most as a result of increase evapotranspiration. This is mostly likely to occur in mountain climates under the influence of continental and Mediterranean climate such as Tibet Plateau, Northern Pakistan and Afghanistan.

With the increase in temperature, many dry river valleys (such as the upper streams of Yangtze, Yellow and Mekong Rivers and their major tributaries) in the Eastern Tibet Plateau will become even dryer and more uninhabitable by human beings. In Afghanistan, the influence of three decades of conflict and chronic land disputes, compounded by years of drought and mismanagement of important resources, has caused widespread degradation of almost all natural resources across the country (Wily 2004; UNEP 2008). Many niche resources in the HKH region such as *Cordyceps* spp. and matsutake (*Tricholoma matsutake*) mushroom are important economic income sources for local communities. These resources often require special habitats that are highly vulnerable to environmental changes.

4 Stressed Ecosystem Services and Implications for Livelihoods of Mountain Societies

Mountain societies survive on the eco-services provided by mountain ecosystems. Climate change can profoundly affect the capacity of the mountain ecosystems in providing all the aspects of services as defined in the Millennium Ecosystem Assessment, which will have far-reaching implications for the livelihoods of the mountain societies. Climate change will have both positive and negative impacts on human wellbeing, but the current understanding is that the negative consequences of climate change will far exceed the positive ones. The authors will not try to exhaust all the domains of implications for mountain communities; instead, they wish to elaborate the following two distinct aspects that are more mountain specific than others: precariousness of resources and disaster-related poverty trap.

4.1 Ecosystem services at stress

Conserving and regulating water, preserving soil, supporting biodiversity, providing fodder and forage resources for pastoral development, maintaining good environmental conditions for agriculture development and producing timber and non-timber forest products are some of the most prominent ecosystems services the mountains of HKH offer. Scientists (Xie et al. 2003, Lu et al. 2004) put the annual ecosystem service value of the ecosystems of Tibet Plateau between USD 150–170 billions. Climate change especially global warming is already having pronounced negative effects on all these services. It has led to the shrinkage of many alpine lakes, reduction of river flow, glacial retreat, and decrease of water resources, degradation on permafrost, desertification, water and soil loss and degradation of rangeland resources. Glacial melting that is widely observed in the HKH region is changing the flow regime of the rivers is causing severe water shortage in dry seasons. In Nepal, this change in the flow regime in the rivers caused by climate change is affecting the operation of many hydro power plants. In some places, glacial lake outburst floods are causing damages to the habitat, life and property of people. These impacts can have severe consequences for a wide range of environmental and economic activities, including substantial negative impacts on food security and human health (IPCC 2007). In Pakistan, for example, climate change is already having severe adverse effects on the natural water storage and glaciers release thereby directly posing threats to food and energy security. Comparing to other countries, Pakistan is highly vulnerable to climatic variability and its impact on land resources. Water availability is already a serious concern in many part of the country. Climate change has already caused decline in precipitation in the country by 10–15 % in the arid and hyper-arid regions over the last 30–40 years. Furthermore, climatic changes increase the vulnerability to drought and flash floods in the area. These natural calamities often pose serious threats to local food production and trigger land degradation and desertification (UNDP 2010).

Mountains have been facing disproportionate burdens to carry in adapting to its impacts. Even small changes in temperature at high altitudes, experts say, will change mountain ecology and ecosystem services. Loss of glacier snow and ice, for example, means less water in glacier-fed river basins during dry seasons. On very steep mountain areas, climatic zones can be expected to change markedly over relatively short distances and hazards scenarios might vary dramatically. This in turn will change quality of biodiversity resources, patterns of agricultural productivity, incidence of pest and disease, availability of water down streams and above all, severity of disasters and vulnerability of poor and marginalized people. Himalayan and Pamir Mountains are often referred as the third pole due to its vast reservoir of ice and snow in the form of large areas of Glaciers that influence the water flows and river systems supporting livelihoods and food security of almost a third of the global population. Mountains are home to some of the world's most threatened and endemic species, as well as to the poorest people, who are highly dependent on their biological resources.

As the largest land use type as well as terrestrial ecosystem in the HKH, rangelands (Stoddart et al, 1975) account for over 60% of the surface of HKH. Over 100 million people in the region have a direct though not complete dependence on the rangeland resources for daily subsistence while over 1 billion people are benefiting from the water resources conserved and regulated by these ecosystems. What is more, rangelands in HKH are habitats for globally important fauna and flora and are therefore venues of many Biodiversity Hotspots and a great number of protected areas of various types and sizes, especially in Tibetan plateau. Climate-induced negative changes are presenting an enormous threat to the provision of rangelands ecosystems services and are keenly felt across the HKH. In China, more than 90% of the rangelands are degraded with about one quarter of them being under severe degradation or threat of desertification (Yi et al. 2009), resulting in sharp decline of fodder productivity and carrying capacity and thus engendering social-economic development of pastoral communities. Even though people are ready to attribute this to human factors such as overgrazing and poor governance, but there are also increasing evidence and belief that natural factors such as climate change are playing the fundamental role. In Afghanistan, annual precipitation determines the available rangeland resources that range between 40% (in poor rainfall years) and over 85% (in good rainfall years) of the total land area of the country (FAO, 1995). Frequent and unpredictable occurrences of drought in recent decades had further aggravated the unpredictability of the rangeland productivity and caused great loss to the life and property of people in Afghanistan. In the prolonged drought from 1997 to 2004, some 70 to 80% of domestic livestock in the northern and western parts of the country perished and an extremely harsh winter in 2007/08 again claimed the life of over 300,000 animals and 800 people (Yi et al. 2009). Yet, a severe drought in the first half of 2008 caused drying up of pasturelands and reduced water sources in several northern provinces (including Samangan, Balkh, Jowzjan, Herat and Badghis) thereby causing deaths of thousands of animals and failure of around 80 percent of rain-fed agriculture (Qazi 2008). Case studies initiated by ICIMOD (unpublished) in Afghanistan, Nepal and Pakistan all found that decrease of rainfall in the rangeland area has often resulted in expansion of degraded area and accelerated desertification process which further weakened the basis for livestock development. The same studies also reported that the disappearance of water resources due to prolonged drought often forced people to change their migration routes or abandon pastoralism completely.

Alpine meadows are very important venues for summer grazing vegetation, medicinal plants and endemic biodiversity in the Himalayas and the eastern periphery of Tibet Plateau (Yi et al. 2007 2008). However, it is reported (Yi et al. 2007) that upward advancement of tree lines triggered by global warming is reducing the area of summer pastures which are critically important for the continued existence of local traditional agropastoral transhumance. Some others (Beniston 2003) suggested that such upward movement of tree lines is also edging out endemic alpine species. Changing environment is threatening the habitats of some of the economically important medicinal plants such as *Cordyceps* spp. that has for years been the major income sources of a great number of mountain people.

In the east of Changthang area of Tibet Autonomous Region of China, the weather is becoming warmer and dryer. Alpine steppe dominated *by Stipa* spp. and Poa spp. that prefers warm and dry weather is spreading southwards at a rate of 14.2km/10a, causing corresponding retreat of alpine meadow community. This change is unfavorable for livestock development since the alpine steppe has much lower primary productivity than the alpine community, which prefers more humid environment (Wang et al. 2004). In the northern part of Tibet, the warming up in spring months is becoming slower but temperature drops more quickly in autumn months (Wang et al. 2004). This change has enhanced the conflicts in seasonal supply of fodder sources and severely affected pastoral development in the region.

Ni (2000) predicted that enhanced CO_2 concentration will significantly increase the NPP of each biome of Tibet Plateau.

4.2 Implications for livelihoods of mountain societies

4.2.1. Coping with resources precariousness

As is discussed previously, mountain systems are highly susceptible to climate change. A direct result of climate change is that natural resources on which mountain people depend for their subsistence will become more unpredictable. A typical case in point is fodder production in the arid and semi-arid pastoral areas of the region such as Tibet of China, Upper Mustang of Nepal, Ladakh of India, North and Southwest of Pakistan and much of Afghanistan. As climatic variables especially precipitation exhibit greater spatial and temporal variability, primary productivity of rangelands, hence fodder resources, also becomes highly unpredictable (Behnke and Scoones, 1993). With the retreats of glaciers and reduction in snow pack accompanied by the rise of snowline, flow volume of the rivers will be more regulated or determined by the monsoon and more rivers will become seasonal rivers. The productivity of farming lands will be subjected to great annual variation and it will be more difficult to forecast crop harvest. Many high-value niche products in the mountains of HKH such as medicinal plants, aromatic plants, non-timber forest products and non-grazing rangelands products will also suffer from greater yield variability which will in turn be reflected in greater fluctuation of market prices. Increased unpredictability in resources availability requires that corresponding institutional arrangements be made so that mountain communities can respond and adapt to resources changes in a quick manner.

4.2.2 Persistent disaster-related poverty trap

Natural disasters often incur great loss of life and property of mountain communities. Increased frequency of natural disasters and more precarious resources due to climate change could easily drag people back into poverty and render many mountain societies unable to accumulate sufficient capital to move out of poverty trap (Sachs 2005; Carpenter et al. 2008). Many mountains communities are frequently victimized by floods, droughts, blizzards and landslides and once in a short while they have to use all their savings to build new houses, purchase new facilities or resettle in new places. For example, floods are an annual event in the Ganges, Brahmaputra and Meghna (GBM) and Indus basins of the Himalayas. Hundreds of lives and billions of dollars' worth of property and investments in high-cost infrastructure are lost in the region every year due to floods, landslides, debris flows and wild fires, along with the destruction of forest and agricultural lands. Over the last thirty years, South Asia has seen more than 65,000 deaths and about a billion people affected from floods and landslides (ICIMOD 2010).

In the Wenchuan Earthquake zone of China, which is in the mountains of the eastern Tibet Plateau, many villages and towns have been repeatedly battered by earthquakes, floods and landslides which have consumed all the family assets of the affected and made many households in deep debt.

5 Recommendations for Building Resilience and Enhancing Adaptation in the HKH Region

Climate change presents major new challenges to both the environment and development processes in the region. Rapidly increasing onset events and impacts demands a major shift to the way the critical ecosystem services including rangelands, biodiversity and forestry are managed. While the rampant poverty in the high lands require continuation of economic growth but the type of resource management needs to incorporate measures to build resilience and adaptation to the impacts of climate change. The Himalayan countries face a daunting set of tasks in building more resilient agriculture and natural resources sectors to protect vital food, energy and ecological security. There is also need for greater understanding and responding to the threat of climate-induced migration. More than 60% of the HKH's economically active population depends on agriculture for their livelihoods. A pro-growth, pro-poor development policy agenda that supports agricultural sustainability, including more targeted adaptive management programme for ecosystem services can improves resilience. The agriculture and forestry sector can also help mitigate greenhouse gas (GHG) emissions in the HKH region if we can provide appropriate incentive mechanisms and innovative institutions, capacity building support, technologies, and management systems and by sequestering carbon in standing trees, soils and range land vegetation. Incorporation of agricultural adaptation and mitigation in the ongoing international climate change negotiations can open opportunities for financing of sustainable growth under climate change constraints in the mountains. Mitigation strategies that support adaptation and development investments with climate change co-benefits should be favored for enhancing ecosystem services in the global mountain systems which provide fresh water for billions of people living downstream.

There is a growing awareness of the impact of climate change and its consequences within the relevant government, non-government, and private sector agencies in the region. Afghanistan, in recent years, has remained active in terms of formulating suitable policy frameworks for sustainable management of water, rangelands and other natural resources but no or a little substantive action is being taken to address the issue. India lunched the country's first National Action Plan on Climate Change in 2008. The plan identifies eight core "national missions", including water use efficiency and sustenance of Himalayan ecosystems. Government of Pakistan has been preparing its National Action Plan on Climate Change. The Chinese Government also promulgated its national Policies and Actions for Addressing Climate Change (State Council of China 2008) which elaborated China's strategies and objectives for addressing climate change and detailed the actions and institutions needed for mitigation, adaptation, public awareness building and international cooperation. Climate change issues in the mountain regions were given specific attention.

Based on the work ICIMOD and its partners have been doing, the following strategies for adaptation to climate change in the HKH region are proposed for national and regional levels:

Awareness raising: Awareness raising through both general information sharing and communication of research finding should be carried out by government and civil society organizations on the specific changes and their consequences and importance of the maintenance of ecosystem services provided by mountain socio-ecological systems. Mountain ecosystems should be recognized by national policy as hotspots of climate change and their fragility, inaccessibility and marginality should be properly addressed. Special emphasis should be given on the conservation of these agro-ecosystems taking care of the specific needs of vulnerable communities such as pastoralists and marginal farmers.

Policy dialogue and policy reforms: Ecosystem adaptation strategies and action plans need to be developed based on sound policy and institutional reforms. Existing sectoral policies need to be critically analysed for their responsiveness to the needs of mountain ecosystems and communities. Furthermore, governments should be supported and encouraged to introduce inter-sectoral policies which are addressing the underlying causes of vulnerability in order to enhance the adaptive capacity of mountain communities through e.g. the promotion of schemes for payments of ecosystem services, policies to tap funds from carbon sequestration and remittances, etc.

Promotion of sustainable adaptive practices: Often local communities are found to be already adapting to the changes independently. Where government can assist them would be in projects such as improvement of infrastructure and more importantly securing good governance of infrastructure, promotion of sustainable, climate proof range land management techniques and integrated watershed management are additional fields where regional organization like ICIMOD can assist governments as a knowledge broker and help build the capacities of the relevant ministries and departments.

Disaster risk reduction: Risk and hazard preparedness should not only be focused on the community level but should rather be based on a national strategy for disaster risk reduction. Organizations like ICIMOD can serve national governments as a knowledge platform providing data, methodologies and building capacities with regard to risk and hazard mapping, development of early warning systems in a mountainous context and GLOF risk mitigation (monitoring of glacier lakes and lowering).

Diversification of livelihood options to build resilience: A number of diversified livelihood approaches can be planned to enhance resilience and adaptive capacity of mountain farmers. For the mountain poor, labor remittances are increasingly becoming significant contribution to their livelihoods and serve as a critical form of social insurance in times of stress (Hoermann and Kollmair 2009). Payments for Ecosystem Services (PES) can form another important source of additional income for vulnerable mountain communities. But here there is a need for innovation and adaptation in view of the growing impact of climate change especially on the water situation. Cooperation between governments, institutions and people is necessary. China is making institutional innovation in eco-conservation through payments for eco-services which are being practiced at provincial level and local level through subsidies transfer and other market approaches. In particular payments for services related to water and carbon sequestration may become increasingly important for mountain communities in view of a globally fast growing carbon economy.

Knowledge management and sharing: Climate change is a global and regional phenomenon and impacts related to climate change do not limit to any national boundaries. Thus, regional (upstream-downstream) cooperation and collaboration are necessary to meet the challenges climate change is imposing on the HKH region and to improve the region's capacity to sustainably adapt to changing climatic conditions. ICIMOD has been practicing and promoting mulit-pronged approaches in this area. Knowledge management, communication, awareness raising, policy dialogue are some of the activities we have launched. Our Knowledge management programme regularly captures shares and disseminates state-of-the-art knowledge and information for the benefit of its member countries and partners in the region. Furthermore, ICIMOD hosts the Asia-Pacific Mountain Network (APMN) which connects regions and members through dialogue and networking. The network captures, enriches and disseminates information on mountainous development issues in and for the Asia-Pacific region.

Regional cooperation through policy dialogue and exchange: Regional cooperation in the HKH to enhance the adaptation of mountains and downstream countries requires regular exchange of good practices among the various agencies. This leads to policy dialogue between the different HKH countries. This is particularly important in the context of transboundary management of mountain ecosystem services such as water and biodiversity. As mentioned above, it is very likely that the availability of water will decrease and the diversity of economic species will be reduced as a result of climate change. ICIMOD is supporting its member countries in developing regional and national frameworks to manage ecosystem services at a landscape level. Within the framework, action plans for transboundary water management, range and watershed development and biodiversity conservation are being planned.

6 Conclusion

Mountains as very fragile and complicated systems are highly susceptible to climate change. They are the providers of essential eco system services and constitute the water towers. Particularly the HKH mountain systems play a unique role as the ecological buffer and water tower of Asia influencing the livelihood and food security of almost a third of the global population. It is already established that climate change is having a major impact on the overall environment of this region. Rapid melting of glaciers, erratic and unpredictable weather, changing rainfall patterns and increasing temperatures impinge on the ability of mountain people to sustain their livelihoods and maintain ecosystem services critical for downstream societies. The consequences of such changes on food, water, environment and energy security increasingly feature as the most important concerns for governments across the Himalayan region. Furthermore, the impacts on critical ecosystems that house valuable floral and faunal biodiversity are of major concern. The need therefore for vulnerable nations is to increasingly build resilience to impacts of climate change and generate resources for adaptation, capacity building, and technology transfer. Regular exchange of best practices and knowledge will be critical to adapt to the changes and reduce the disaster risks that are likely to increase. Regional cooperation and cross-border exchanges of information will play a vital role in realizing such goals.

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2.2 Pastoralism in Central Asian Mountain Regions

Hermann Kreutzmann[6]

Abstract

The position of Central Asian deserts and oases between the densely populated regions of Asia and Europe centres of gravity has strongly influenced economic exchange, territorial power games and communicative curiosity directed towards sparsely inhabited and marginally utilized areas. The symbiosis of highly productive and spatially concentrated oases in a wide-ranging environment with extensively utilized rangelands in deserts and steppe regions is modified by the third dimension represented in the verticality of Central Asian high mountains. Throughout long historical periods Central Asia became the focus of explorers, expeditions and expansionist conquests. During the "Great Game" and thereafter, the territorial division of Central Asia resulted in effective boundary-making that significantly affected local livelihoods. In the Central Asian context, aridity and altitude as two limiting parameters for human activities at the peripheries of settlement space need to be highlighted for the perception of steppe ecologies. Diachronic enquiries into politics and society provide insights for the interpretation of history and economy as they affect pastoral livelihoods.

In conventional views, pastoralism was classified as a stage of civilization that needed to be abolished and transcended in order to reach a higher level of development. In this context, global approaches to modernize a rural society have been ubiquitous phenomena independent of ideological contexts. The 20th century experienced a variety of concepts to sedentarize nomads and to transfer their lifestyles to modern perceptions. Permanent settlements are the vivid expression of an ideology-driven approach. Modernization theory captured all walks of life and tried to optimize breeding techniques, pasture utilization, transport and processing concepts. The aspect of higher requirements for inputs tended to be neglected when the modernization of animal husbandry was at stake.

New insights into other aspects of pastoralism such as its role as an adaptive strategy to use marginal resources in remote locations with difficult access could only be understood as a critique of capitalist and communist concepts of modernization. The rejection of input-dominated theories that triggered enhancement of outputs but neglected ecological considerations regarding sustainability

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opened up a new field for research combining ecology, economy and society. This perception might gain further in importance when mitigation strategies coping with climate and society are debated.

Pastoralism can be perceived as a flexible strategy to adapt to changing survival conditions, rather than a transitory stage on the path to modern development. Pastoralism was adopted by people when opportunities arose, when it was economically sound and when the challenges posed by ecological and socio-political environments could be managed. Consequently, our emphasis on pastoralism studies provides us with an important tool to understand society in general, but human-environmental relations in particular.

Central Asia poses a unique arena for understanding the spectrum of mountain pastoralism and rangeland management. In a similar ecological environment of desert-steppe conditions, the cases of different communities are presented in order to illustrate variegating paths of socio-economic and politico-historical developments that are the result of inner-communal dynamics and external interventions. Four case studies are presented from Afghanistan, Tajikistan, Pakistan and the PR of China highlighting the external interference in regions dominated by Pamirian mountain farmers and Kirghiz nomads. The societal and political transformations during the 20th century significantly modified the economic frame conditions, possibilities of political participation in decision-making processes, and cross-border exchange relations. Former commonalities among the studied communities have been transformed by inner-societal processes and by external linkages in response to decoupled exchange options.

1 Introduction

Pastoralism has played a major role in Central Asia since times immemorial. Nomads functioned as transporters and communicators between oasis settlements, as powerful actors controlling passages and providing security to trade caravans. The Silk Road exchange over vast tracts of deserts, steppes and mountain environments became feasible because of pastoralists covering huge distances with transport animals and valuable loads.[7] Mountain passes functioned as thoroughfares for the Inner Asian traverses, but especially for the connection between the Tibetan Plateau and South Asian rimlands across the Himalayas as well as between the Central Asian oases along the Silk Road and the trans-mountain areas beyond the Hindukush, Karakoram, Kun Lun Shan and Pamir. Vital passages were controlled by herding communities that, in addition to animal husbandry and livestock-breeding, engaged in transport services across difficult passages and functioned as guides and guards for trade caravans. These activities hint at three important aspects of pastoralism in Central Asia mountain regions. First, pastoralism needs to be interpreted as embedded in the overall economic exchange of goods between farmers and bazaar traders on the one hand and pastoral meat and milk producers on the other. Second, an understanding of pastoralism alone would produce an isolated picture of livelihood generation, while other important components would be omitted. Third, the socio-political framework needs to be taken into consideration as pastoral strategies incorporate answers to challenges by powerful actors and stakeholders. State interference has often resulted in state evasion[8]; consequently pastoralists have tried to avoid payment of heavy grazing taxes, to escape from forced conscription and bureaucratic domination, to elude slavery, forced labour and religious persecution. Pastoral strategies of resource utilization in remote locations are an example of survival strategies in the periphery. Attempts at modernization in the aftermath of the Russian and Chinese revolutions incorporated sedentarization programmes, introduction of hitherto unknown forms of social organization as well as transformations of production strategies and consumption patterns.

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[7] Cf. Christian 2000, Khazanov 2005.

Our concern with pastoralism in Central Asian mountain regions requires adopting different perspectives in order to understand the environmental setting for mountain pastoralism, to investigate the diachronic dimension of change in pastoral settings and to evaluate attempts at forced modernization and adherence to sustainable development.

2 Central Asian Mountain Environments

Central Asian mountain regions are characterized by environmental conditions that mainy resemble high mountain valleys and plateaux. Altitude and aridity (Fig. 1) cause thermal and hydrological natural thresholds for farming, which can, at least partly, be overcome by human action and innovation. The limits for crop cultivation support a structure that is composed of concentrated oases and wide areas above and beyond agro-ecological thresholds. Here we find the environmental conditions that support pastoralism and rangeland management.

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[8] Cf. Scott 2009.

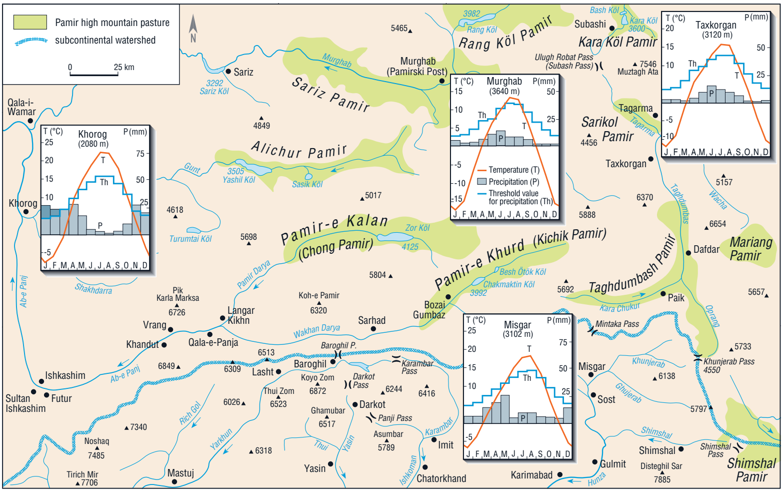

Fig. 1: The Pamirs – high altitude pastures and rangelands in an arid setting

The Wakhi colloquial term "*pamer*" reflects the specificity of the fertile high mountain pastures and was taken as a defining feature to describe natural grazing grounds of substantial extent as "Pamirs".[9] In the 19th century, when the limits of human habitations and the origins of rivers were explored, the Pamirs gained in importance. Since the explorations of John Wood and the compilations of George Curzon, geographers and ecologists have agreed to acknowledge seven major Pamirs (Fig. 1), each 300 km^2 in size.[10] Four of these are located in the Eastern Pamirs of Tajikistan and part of Gorno-Badakhshanskaj Avtonomnaja Oblast (GBAO). The Kargushi Pamir (the Pamir of the hare) surrounds the Great Kara Köl (black lake). To its southeast the Rang Köl (coloured lake) Pamir encloses the lake of the same name. The central settlement of the Eastern Pamirs is Murghab and was founded as the Russian Pamirski Post within the Sariz Pamir (Pamir of the yellow trail). Further southwest the Alichur Pamir is located in the valley of the same name. All the four Pamirs within Tajikistan are nowadays easily identified by the permanent settlements located there. The two Afghan Pamirs – the Chong Pamir in Kirghiz or Pamir-e Kalan in Dari (Great Pamir) and the Kichik Pamir or Pamir-e Khurd (Little Pamir) – are located in the northeasternmost narrow strip of Afghan territory bordering with Tajikistan, Pakistan and China. The only major Pamir of China is located in Sarikol in the Tajik Autonomous County within the Uigur Autonomous Region Xinjiang. Its traditional denomination is Taghdumbash Pamir, and it occupies the headwaters of the Taghdumbash river, south of Taxkorgan.

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[9] Kreutzmann 2003, 2009.

[10] Cf. Curzon 1896, Dor & Naumann 1978, Kreutzmann 1996, 2009, Wood 1872.

In addition to the seven extensive Pamirs, some smaller Pamirs such as the Pamir-e Bugrumal (upper Gunt Valley, Gorno-Badakhshan), Mariang Pamir (Sarikol), Tagarma Pamir (Sarikol), Little Kara Köl Pamir (Kizil Su) and Shimshal Pamir (Gilgit-Baltistan) may be added. Natural grazing is the major asset of the Pamirs, augmented by meagre cultivation.

The overall setting is characterized by three areas. The valley bottoms are mainly inhabited by Pamirian mountain farmers who live in permanent villages and who seasonally access nearby pastures in the side valleys. Above 3500m the main valleys widen and become flatter; here we find the extensive Pamir pastures. Both the Wakhi and the Kirghiz utilize these. The Wakhi follow a pattern of retreat to their homesteads for the cold season, while the Kirghiz remain in the high altitudes. The third area is solely dominated by Kirghiz nomads. The high plateaux favour mobile pastoralists as the distance to the permanent dwellings in the river valleys increases. Nevertheless, growing demand for natural grazing and mutual dependency have resulted in abridged utilization patterns, mobility and political interference.

3 Traditional Pasture Utilization Strategies

The two major adaptive strategies of utilizing the pasture potential of Western High Asia under given ecological constraints occur in the livestock sector of combined mountain agriculture and in nomadic animal husbandry (Fig. 2).[11]

(i) Combined mountain agriculture has the advantage of simultaneous fodder production in the permanent homesteads for herds which are grazed in the high-lying pastures during the summers. The limiting factor here is the provision of feed for up to nine months, which has to be produced on private or common property village lands. Farmers' habitations are usually located at the upper levels of permanent settlements in single-crop farming areas. Access to the Pamir pastures involves shorter migrations and some mobility within the summer habitations. Fodder here is comparatively plentiful, but only available for a short period; feed storage and transport to the homesteads are of limited importance.

(ii) Nomadism incorporates the advantage of greater mobility. At least traditionally, nomadic groups were able to exploit natural resources at dispersed locations. Great distances in the order of several hundreds of kilometres separated economically valuable mountain pastures in summers from winter camp sites with areas of less economic interest lying in between.

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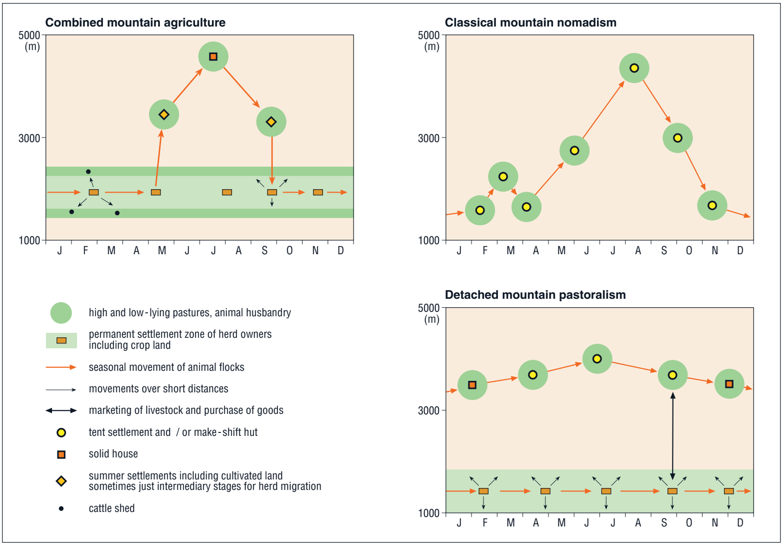
[11] Cf. Ehlers & Kreutzmann 2000. For a wider debate on classifications and interpretation of nomadism and pastoralism cf. Barfield 1993, Humphrey & Sneath 1999, Khazanov 2005, Khazanov & Wink 2001, Salzman 2004, Schlee 2005, Scholz 2008, Tapper 2008.

Sometimes spring and/or autumn pastures were frequented when suitable forage was provided. Projected on the studied region, a “classical mountain nomadism” with functional migration cycles could be established in a historical context: longer stays in high-altitude pastures during summer alternate with winter grazing in low-lying basins in the northern foothills or plains of the Inner Asian mountain arc. In both areas the nomads are dependent on being tolerated as a mobile group and being able to pay the grazing fees if applicable.

(iii) Detached mountain pastoralism is a more recent strategy reflecting societal transformations, collectivization and forced sedentarization and settlement in high-lying grazing grounds. Basically the long-distance migrations ceased to exist and were replaced by short-distance migrations at a rather high altitude of permanent abodes, usually above 3000m. The former winter grazing grounds have become rural settlements with crop cultivation and their own livestock regime. Both areas are connected by annual exchanges of goods. Livestock products are exported from the high pastures and exchanged for all kinds of necessities needed for life in the Pamirs.


Combined mountain agriculture
Classical mountain nomadism
Detached mountain pastoralism
5000 (m)
3000
1000
J F M A M J J A S O N D
high and low-lying pastures, animal husbandry
permanent settlement zone of herd owners including crop land
seasonal movement of animal flocks
movements over short distances
marketing of livestock and purchase of goods
tent settlement and / or make-shift hut
solid house
summer settlements including cultivated land sometimes just intermediary stages for herd migration
cattle shed

Design: H. Kreutzmann

Fig. 2: Pastoral strategies in Central Asian mountain regions

All approaches can result in competing for natural resources in the same location and have frequently been discussed from that perspective. The ecological aspect has been expanded to the debate about conflicting economic strategies. Sometimes the political dimension of power and influence, grazing taxes and the levying of them, threat and security is neglected.

In the discourse of moderniza¬tion and social change, nomadism's place is usurped by agriculture. In the context of development in stages, the sequential order of nomadism prior to crop farming is highlighted, although historical evidence pinpoints always to the co-existence of both. Modernization theory made it a vital argument to perceive progress as a transition from mobile economies to settled farming and entrepreneurship. The co-existence of both in Central Asian mountain regions reflects the complementarities and interdependence: nomadism/pastoralism is not feasible without exchange relations with farmers and markets. Nevertheless, the altitudinal limits of habitations and the utilization of marginal lands have significantly shifted towards high-lying and arid areas. The extensive utilization of marginal resources is superseded by intensification and increasing external in-puts. Thus, it is not surprising that mountain farmers and pastoralists have been a prime target for "development": Development", which aims to reduce subsistence levels by integrating people from the periphery into the mainstream of nation states, thus endangering and transforming "traditional" lifestyles and locally developed economic strategies.

4 Wakhi and Kirghiz in the Pamirs – Social and Political Organization

This paper distinguishes two groups of mountain dwellers that are dissimilar in their agricultural practices. The Wakhi represent a group of people who in majority follow a resource utilization strategy of "combined mountain agriculture", whereas the Kirghiz have a record of "classical mountain nomadism". Nearly all Kirghiz communities are nowadays restricted to their mountain abodes. One purpose of this paper is to highlight the developments that led in different nation states to similar developments, to the transition from "classical mountain nomadism" to a variety of forms that could be categorized as "detached mountain pastoralism" (cf. Fig. 2). There are many more differences between Wakhi and Kirghiz communities that represent distinguishing parameters. While Wakhi are almost exclusively followers (*murid*) of the Aga Khan and follow Ismaili Shia belief, Kirghiz to a similar degree profess Sunni Islam as their sole denomination. The Wakhi speak an Eastern Iranian language whereas Kirghiz belongs to the Turkic language group.[12]

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[12] Cf. for a linguistic survey of languages prevalent in the Hindukush-Karakoram-Pamir region Kreutzmann 2005. A more in-depth description of Wakhi and Kirghiz communities and practices can be found in Bower & Johnston 2007, Dor & Naumann 1978, Felmy & Kreutzmann 2004, Shahrani 1979.

Outsiders call the Wakhi by this etic ethnonym which describes their language as well. The Wakhi refer to themselves as *xik* for people and *xik zik* for their language. Why this discrepancy? By their neighbours and by visitors, the Wakhi were identified as the people living in Wakhan. Until 1883 it was a principality on both banks of the upper Amu Darya and the Wakhan and Pamir Darya. Wakhan was ruled by a hereditary ruler (*mir*) who controlled a territory in which sedentary mountain farmers and Kirghiz nomads were living. Both communities paid taxes and tributes in cash and kind to him. Wakhi society consisted of an upper stratum: the ruling family (*mir*), some religious leaders (*pir, sayid, xuja*) and a few better-off families (*sana, xaybari*). The vast majority of the people (>95%) were "ordinary" people (*xik*) who practised combined mountain agriculture and were obliged to deliver taxes and services such as duties of load-carriers and soldiers.[13] This societal set-up has been affected by external and internal developments. Overall it can be stated that the number of poor households has significantly grown in recent years. While 35 years ago barely 12% of the 700 household could be classified as poor, our survey in 2003 returned evidence that among 1100 households 800 could be termed as pauperized and faced severe difficulties to make a living.[14] Wakhan's physical isolation from its neighbours and from the domestic markets in Afghanistan has increased poverty and dependency in the Afghan Pamirs.

Wakhan was no exception in Western High Asia, where many valleys or parts of them were identical with principalities which had more or less strong links to their mighty neighbours: the Amir of Afghanistan, the Emir of Bokhara (later replaced by Tsarist Russia/Soviet Union), the Chinese Emperor and British India. The competition between these major players affected diplomatic relations, taxation, conscription policies, local politics and economy, and finally resulted in the delineation of international boundaries and the termination of independence.

The Kirghiz were more flexible, not only living within Wakhi administration or under constant domination. Their mobility enabled them to shift to grazing grounds with favourable conditions, i.e. low taxation and tolerable political pressure for the time being. The family histories of Kirghiz clans abound in stories about leaving some territories and starting a new life under different conditions, masters and/or protectors.[15] But always the search for suitable pastures and low outside interference was the guiding principle. Among themselves Kirghiz were organized in a tribal structure mainly composed of Kesek, Kipchak, Naiman and Teyit.[16] Migratory groups were headed by a camp elder (*beg, khan*) who normally represented the most affluent family. Within their communities, a highly stratified hierarchy existed where the poorer yurts were occupied by mere shepherds in the service of big herd-owners of yaks, sheep, goats, Bactrian camels and horses. The affluent leaders and rich households profited from the system of renting out their livestock and giving it into the safe custody (*amanat*) of shepherds (cf. Shahrani 1979). Kirghiz communities formed their own microcosms in the Pamirian pastures with more or less strong relationships to their neighbours. Common goals were the defence of grazing grounds and the avoidance of outside interference.

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[13] Felmy & Kreutzmann 2004, Shahrani 1979.

[14] Felmy & Kreutzmann 2004: 102–104.

[15] This practice is vividly depicted and illustrated in the docu-fiction by Ben Hopkins (2006) called "37 uses for a dead sheep" in which Kirghiz from Afghan Wakhan and in exile in Turkey play their own history and provide an excellent example of the challenge between history and memory.

The setting has some interesting features. The Wakhi and Kirghiz represent communities competing for the same resources. These resources are accessible in the high-lying Pamirian pastures that form a unique ecological asset of a region that is subdivided by international boundaries. Contesting for resources means in this context that resources of equal value, i.e. natural grazing grounds, pastures, fuel and water, are to be found within the boundaries of different principalities, emirates, empires and/or nation states. The natural setting suggests rather homogeneous environmental conditions, while politics and power struggles make the difference across boundaries. Consequently, borders stratify the developments and living conditions for mountain dwellers to such an extent that they become strong parameters for the understanding of change in the Pamirs. Competition was ubiquitous, and relations between neighbouring groups were not always amicable. Both were involved in a power struggle for survival where threats came from direct and distant neighbours as much as from raiders, slave traders, representatives of the administration, conscriptors and tax officials.

5 Environmental Assets and Constraints

For nomads the extensive use of wide-ranging pastures is essential. From their perspective, any restriction to migration and the limitation of accessible pastures are perceived as an environmental and political crisis. In the case of high mountain nomadism the principle of maximum utilization of natural pastures is linked to grazing the flocks at high altitudes (above 3500m) during summer and to keeping the herds in low-lying pastures (around 1200m) during winter (cf. Fig. 2). The Kirghiz strategy in the Pamirs was based on such an approach. During winter the urban oases of the Southern Silk Route or in the Fergana Basin offered opportunities for keeping the herds on agricultural fields after harvest. The animals scavenged for any remainders and grass, while improving irrigated lands in the oasis through leaving their droppings as valuable manure. At the same time the Kirghiz practised business and trade before retreating to the high pastures for the summer. These times are long bygone. Basically, everywhere the element of low-lying winter pastures is missing today. The expansion of cultivation in irrigated oases, the introduction of stationary livestock-keeping there and the increasing urbanization have led to an ubiquitous exclusion of nomadic entrepreneurs and their herds. Furthermore, political changes such as collectivization and central planning affected the long-established patterns of animal husbandry for all previously involved groups. To sum it up, the accessible pastures are to be found nowadays where modernized agriculture failed to grow crops or where political circumstances permitted. Those grazing grounds are generally located in remote locations above 3500m altitude. A by-product of this development is the increasing pressure on local grazing and fuel resources.[17] The expansion from a summer stay to a permanent habitation in the Pamirs has led to an enhanced exploitation of all locally available resources: fodder from natural pastures, fuel from bushes and shrubs, wildlife and game for nutritional purposes.

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[16] Cf. Abramzon 1962: 200–203; 1963: 198–200, Bregel 2003: 78, Dor & Naumann 1978: 49, General Staff India 1907, Kreutzmann 1995: 163.

For the Wakhi mountain farmers the situation is modified by irrigated crop farming. The expansion of households predominantly engaged in agriculture resulted in a higher demand for natural resources which in themselves are rather limited. Their abodes close to the limits of permanent habitations in their respective settlement regions controlled agricultural village lands that provided returns from crop cultivation (wheat, barley, beans and peas, later on potatoes as well). Their strategies of "combined mountain agriculture" (cf. Fig. 2) worked well when combined with livestock keeping that utilized the elevated natural grazing on high-lying summer pastures close to their villages. Although there is competition with Kirghiz nomads for high pastures during summer, the real constraint occurs in winter. The fodder production in the homesteads competes with food production as the village lands are rather limited. Crop farming at the upper altitudinal limit not only faces climatic vagaries and threatening weather conditions, but gives comparatively low returns, and bears little scope for expansion. Consequently, animal husbandry is gaining overall importance in their regional production system. Any changes here cause major consequences for the livelihood conditions of the people concerned and require adaptive strategies to mitigate the risk by broadening the production and income portfolio.

6 Transformations in Pamirian Pastoral Communities

The complexity of socio-cultural problems and the manifestation of transformation processes in societies with economies based on pastoralism vary from region to region. The cases presented here emphasize the rearrangements in the livestock sector initiated by external intervention. The four examples show how political frame conditions have affected the livelihood conditions of Kirghiz and Wakhi in the Pamirs during the 20th century with long-lasting effects that affect present-day strategies and influence adjustment mechanisms.

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[17] Cf. Samimi et al. 2009.

6.1 The effects of soviet collectivization and sedentarization

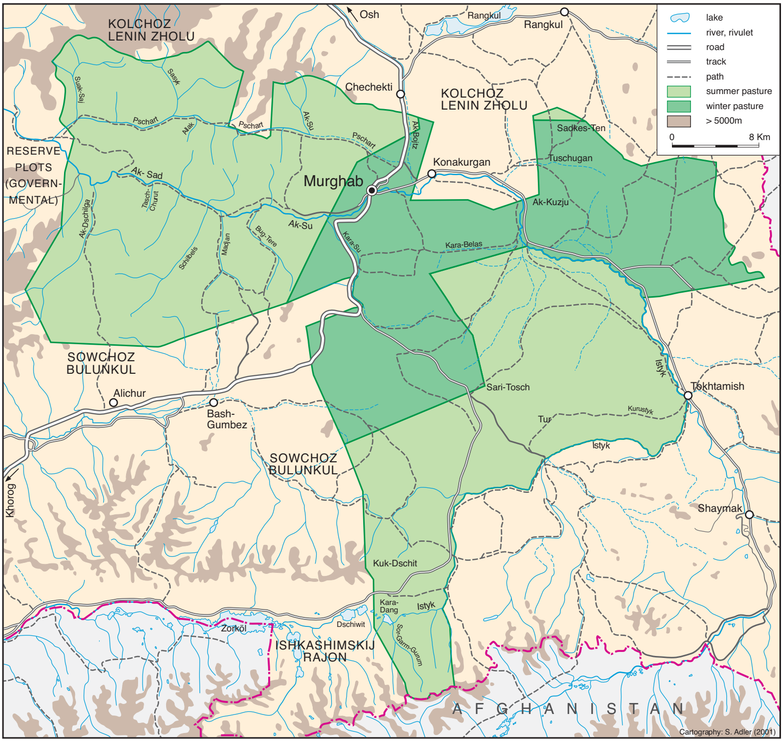
Four major Pamirs are located within the Gorno-Badakhshan Autonomous Oblast (GBAO) of the Tajikistan Republic. Stalinist modernization programmes in the 1930s aimed at transforming local herding communities into settled collective farms. At this stage, nomadic production and life-style was declared backward and intolerable. Consequently, the system of pasture utilization under Kirghiz begs was replaced by *kolchoz* (*kollektivnoe chozjajstvo* = collective economy) and *sovchoz* (*sovetskoe chozjajstvo* = Soviet economy) settlement-centred seasonal migration of herds. Collective and/or Soviet state farming meant here that winter quarters were established from which the collectivized herds were brought to pasture. The flocks were controlled by shepherds of the respective units, while during summer yurt encampments remained as subsidiary branches of the unit. Where it seemed feasible, fodder production was increased and attempts to improve the breeds and health conditions of the herds were made. Permanent winter stables with adequate infrastructure, veterinary treatment and sufficient fodder contributed to a new settlement cell which resembles some aspects of Pamirian pastoralism in present times.

The Soviet modernization project changed lifestyles and civil rights. To quote contemporary sources on the contents of Stalin's modernization project: "The CPC of the Tajik S.S.R. is drawing up a plan for agriculture in the Pamirs, the idea being thereby to transform the migrant tribes into stationary inhabitants, and to encourage them to grow their own food instead of importing it. A biological station on the Pamirs, at a height of 4,000 metres above sea-level, is just being started" (Pravda 7.5.1934, quoted after IOL/P&S/12/2273). The "Pravda" told the truth: modernization meant the sedentarization of nomads, which was executed with great force and rigour. The effects of settlement and the introduction of "modern" animal husbandry can be observed in all areas north of the Amu Darya, whereas on the southern bank of the river "traditional" forms of livestock-keeping prevail.

Similar developments could be observed in people's organization, education and agriculture. To quote again a source from 1934: "Khorog is the capital town of the Soviet Pamir, and there has been held there the 5th congress of the Soviets of the mountainous Badakhshan region. On foot on horses, on yaks, on donkeys, along mountain tracks hanging over precipices, the delegates come from the distant Murghab, Borgang [Bartang], Bakhan [Wakhan], and other places in the S. and E. edges of the U.S.S.R. that border with Afghanistan, India and Western China. The 110 delegates elected were 78 Tajiks, 16 Kirghiz, and 16 Russians. In the conference hall were many women in their white garments of homespun silk. Khorog is now lit with electricity that was started and first seen by the Pamir people in the spring of this year. The president of the congress, Faisilbekov, spoke of the wonderful things that have taken place in the Soviet Pamir. Aeroplanes are flying over inaccessible mountain ranges, a splendid automobile road has been made from Khorog to Osh, 700 km long, that now links the Pamir with the rest of the U.S.S.R. formerly there was only 1 school in the whole of the Pamirs – now there are 140, and a training school for teachers: instead of dark smoky earth huts or skin tents, European houses are now being built: collective farms are established in the Pamirs, and they are growing and getting good crops of wheat, millet and beans; and now they know how to manure their fields and be sure of good crops" (Izvestia 29. 11.1934, quoted after IOL/P&S/12/2273).

Under Soviet rule Tajikistan's economy was completely integrated into the centrally-planned union system and subjected to decrees from the centre. This had significant effects even on the remote mountain areas, as the case of Gorno-Badakhshan reveals. The Soviet state-run economy had selected the Eastern Pamirs primarily as a sheep and yak-producing region (Fig. 3). All other agricultural activities prevalent before were subordinated to the dominant livestock sector. The map (Fig. 3) shows the administrative set-up of the 1960s: Kolchoz Murghab, Kolchoz Lenin Zholu (Fig.4) and Sowchoz Bulunkul. State farms and collective farms composed the organisational structure of Pamirian agricultural and production. Irrigated village lands formerly utilized for grain production were converted into fodder production zones. The Wakhi members of *sowchos roi kommunizm* in Rajon Ishkashim kept a sizeable yak herd in the upper parts of the Amu Darya valley and in Khargushi Pamir. Even in low-lying Wakhi villages *alfalfa* and fodder crops had replaced barley, wheat and beans. Their whole agricultural system was devoted by decree to animal husbandry, because all other food supplies were imported from outside. Even high-protein fodder (50 tons) was annually brought in from as far as Kyrgyzstan to sustain a herd of 450 yaks all year long in the Pamirs.

Summer and winter pastures of the Kolchoz Murghab, Murghabskij Rajon, Tajikistan



Kolchoz	utilization	total area (ha)	irrigated area (ha)	crop land (ha)		fallow (ha)		meadows (ha)		pasture (ha)				others (ha)	fodder storage (tons)
				total	irrigated (ha)	total	irrigated (ha)	total	irrigated (ha)	total	irrigated	summer pasture	winter pasture		
Murghab	permanent	5992	5992	62	52	160	-	1894	10	2114	-	2114	-	1772	142
	long term	700473	700473	-	-	-	-	-	-	71285	-	33914	37371	629188	6918
	total	706465	706465	62	52	160	-	1894	10	73399	-	36028	37371	630960	7060

Source: own design based on Kolchoz map of 1964

Fig. 3: Distribution and location of summer and winter pastures of the Kolchoz Murghab in the 1960s

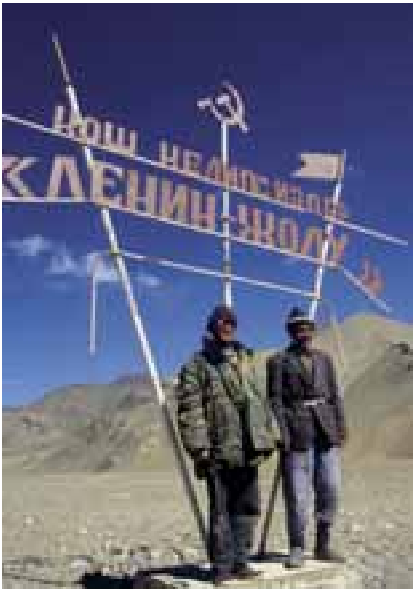


Fig. 4: Lenin Zholu – the way of Lenin – is still to be found as the name of the former collective farm in Rangkul (photograph July 19, 2010 © Hermann Kreutzmann)

With the independence of Tajikistan and the transformation process, individual ownership of land (1996–1999) and cattle were re-introduced. Yak-herding is organized through the farmers' associations; the shepherds keep 70% of the production, while the rest belongs to the association. The Wakhi of Ishkashim still control a herd of 288 yaks besides 50,400 sheep and goats. In neighbouring Rajon Murghab with more than 3,100 households (85% Kirghiz) nearly 15,200 yaks and 45,900 sheep and goats were kept in 2008.[18] The majority of herds are controlled by private farmers' associations and one cooperative farm, the successor organizations of *kolchoz* and *gozchoz* (= state farm).

After the failure of the Soviet model of modernization we experience a reversal of the path of "development". Two to three generations ago, the Kirghiz nomads and Wakhi mountain farmers were expropriated and their property was collectivized. Consequently, they had become state employees. But now resources and property have been redistributed. The present socio-economic transformation process has forced the majority of Kirghiz and Wakhi to follow an agricultural subsistence strategy based on crops and livestock. It appears to be a return to their father's survival strategies, but global and regional conditions are much different. The present income levels are far below previous ones, and it remains to be seen whether this resource-based strategy will be sustainable. The level of insufficiency and depression is high as many young people out-migrate and seek low-level employment mainly in Russia.[19]

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[18] I gratefully acknowledge the provision of most recent data by Tobias Kraudzun.

The previous interrelationship of Pamirian pastoralism and supply structures of the Soviet Union became obsolete. Nowadays no fodder supply can be transferred across state borders. Even the Kirghiz residents of Sary Mogol (Alai valley, Kyrgyzstan) who were counted as belonging to the Eastern Pamirs of Tajikistan had to decide by 2004 whether they wanted to be included in Kyrgyzstan. They opted for Kyrgyzstan and continue to settle in Sary Mogol. Consequently, the pastoral system in the Eastern Pamirs has changed. Households depend on local resource utilization as much as on the additional income from migrants' remittances, entrepreneurship, services and trade. The resource base is diminishing as well. In afirst step, during Soviet Rule a sizeable tract of pasture and rangeland was excluded from animal husbandry as a neutralized zone was created that acted as a buffer zone between Tajikistan and the PR of China. The "celostnaja sistema"[20] or briefly as it is now called "sistema"[21] represented a border control scheme that significantly affected the livelihoods of pastoralists. In recent years a transfer of rangeland from Rangkul to the PR of China under international law has reduced the available pasture for that community. A compensation scheme is discussed and needs to be implemented. Overall, the pasture resources are shrinking while the pressure on resources is growing.

6.2 Challenges for nomad – mountain farmer relations: chinese reforms in sarikol

The Taxkorgan or Sarikol (name of the former principality) area comprises three different ethnic groups: Sariqoli, Wakhi and Kirghiz (here less than 5 % of the population). The first two groups comprise more than four fifths of the 35,000 inhabitants.[22] The Wakhi and Sariqoli – Tajik in Chinese terminology – practise a combined mountain agriculture composed of crop cultivation and animal husbandry with seasonal utilization of Pamir pastures, while the Kirghiz solely specialize in livestock. All three groups traditionally move their flocks within the Taghdumbash Pamir and had been tributary to the Mir of Hunza who exercised control over these pastures until 1937. Whereas the Kirghiz lived in the higher elevations, the Sariqoli approached from the northern low-lying villages.[23] Only the Wakhi, who stranded as refugees from Afghanistan, founded their settlement of Dafdar (3,400 m) in the heart of the Taghdumbash Pamir about a century ago, with the consent of the Chinese authorities. All three groups have competed for the fodder resources there. In recent years the trend of diminishing importance of the primary sector has accelerated: in 2007 it contributed only 15% to Taxkorgan's GDP.[24] In 1984, the primary sector contributed 95%; the livestock sector's share was by far the highest and amounted to more than two thirds.[25] Nevertheless, the livelihoods of mountain farmers and pastoralists are still dependent on utilizing naturally available resources and on managing the abundant rangelands. The county's mountain farmers and pastoralists have faced significant changes and had to adapt to a number of reforms that were implemented in one of the remotest corners of the PR of China.

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[19] Cf. for the importance of migration to Tajikistan's income generation Olimova & Bosc 2003; Olimova & Olimov 2007.

[20] Sumarakov 2006: 169–179.

[21] Kreutzmann 2009.

[22] Cf. Kreutzmann 2009, Yibulaying 2009: 135.

[23] Cf. Kreutzmann 1996, 2003.

In the aftermath of the Chinese Revolution in 1949 and the formation of the Tajik Taxkorgan Autonomous County (Fig. 5) in 1954, collectivization was introduced and rural communes (*gungshe*) and production brigades were established in all villages. The role model from the neighbouring republics was implemented by Chinese revolutionaries and their Soviet advisors. Basic infrastructural assets have been provided to all communities of the Taghdumbash Pamir.

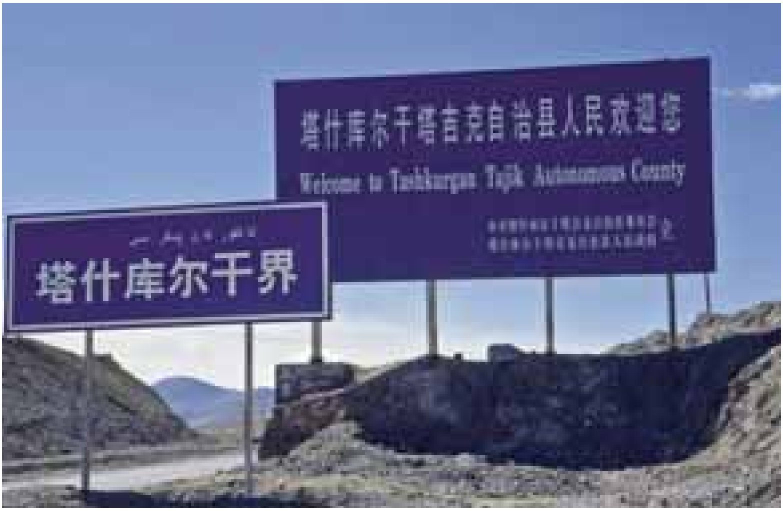
塔什库尔干塔吉克自治县人民欢迎您
Welcome to Tashkurgan Tajik Autonomous County
塔什库尔干界

Fig. 5: The status of autonomy prevails in the Tajik Taxkorgan Autonomous County (photograph October 15, 2008 © Hermann Kreutzmann)

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[24] Yibulaying 2009: 138.
[25] Kreutzmann 1996: 219.

In its efforts to implement poverty alleviation strategies in Xinjiang in general and in Taxkorgan in particular, the Chinese Government has designed several programmes; the most recent one is part of the "Programme on development-oriented poverty alleviation in China's rural areas" (2001–2010). Taxkorgan County is a priority target region in Xinjiang's poverty alleviation programme that aims at "building of water, electricity and road infrastructure; protection and utilisation of grazing lands; livestock improvement and epidemic disease prevention and control; production of plateau-specific organic food; experimenting on ecological relocation; development of schools, health centres and cultural rooms; training of applied technology and employment skills".[26] Rangeland management and animal husbandry continue to play a significant role for the Taghdumbash Pamir.

Modernization has reached the Wakhi and Kirghiz the Chinese way. Economic liberalization and political authoritarianism remain the conceptual basis. Consequently, Taxkorgan's location along the Karakoram Highway (KKH) and the "open-to-west" strategy in Kashi Prefecture has changed the local economy. Kirghiz and Wakhi participate in tourism and trade-related activities and maintain their pasture utilization as the economic backbone and security measure.

6.3 The winds of change in Little Kara Köl: Kirghiz pastoralists in Kizil Su

The Kirghiz of Kizil Su are a prime example of "classical mountain nomadism" (cf. Fig. 2), as was reported by Sven Hedin (1894, 1899). They followed a long-distance nomadic migration cycle between the summer grazing grounds in the Pamirs and the irrigated oases of the mountain forelands. Kirghiz nomads spent the winter occupied with herding and various other businesses in the towns of Kashgar and Yarkand. The usual pattern has been principally and significantly abridged within the last 60 years (Fig. 6). Nowadays the Kirghiz nomads are confined to the Pamir regions with their herds all year round. Only for marketing purposes do they leave their mountain abodes and travel on foot with their flocks or on rack body trucks down to the Sunday markets of Kashgar and/or Yarkand. Thus, the herds cover the distance of 280 km easily and without great loss of weight.

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[26] Qu 2009: 145.

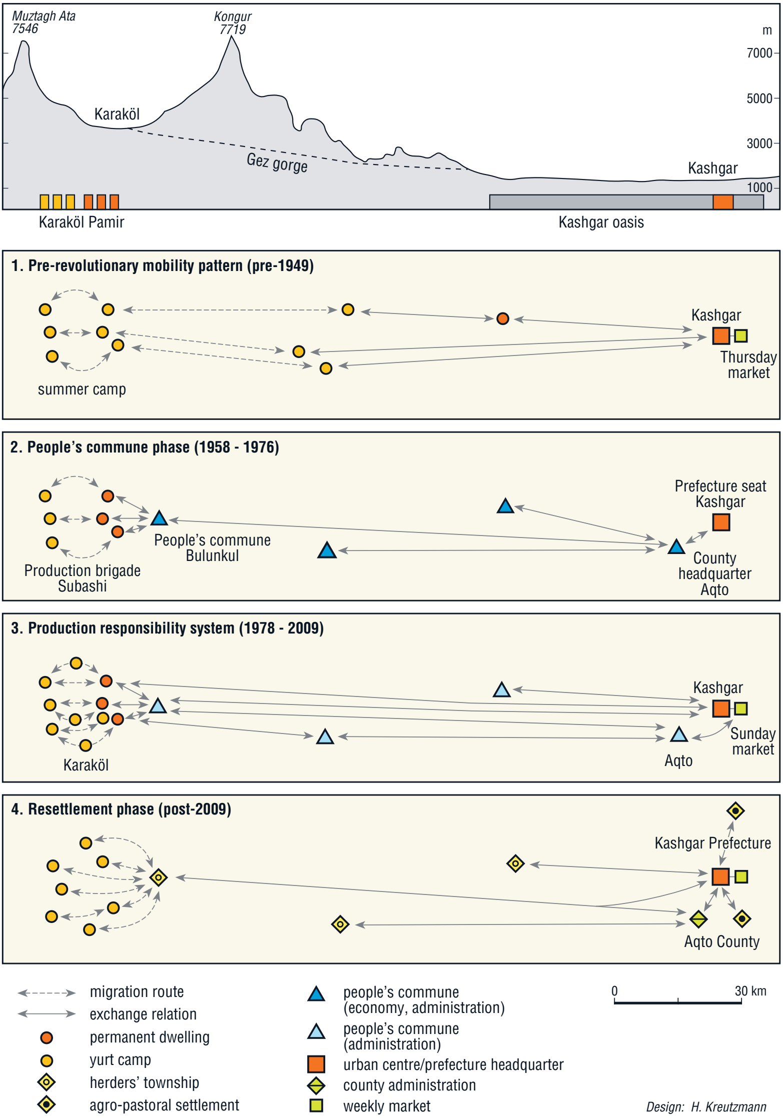

Fig. 6: Transformation in pastoral strategies in Little Kara Köl Pamir

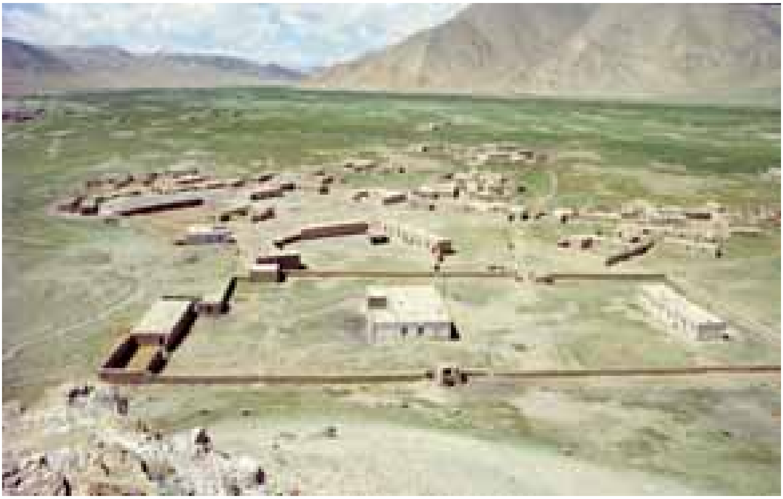

Fig. 7: The settlement of Subashi as the production brigade's centre for infrastructural assets (photograph July 24, 1991 © Hermann Kreutzmann)

The pasture system has been adjusted to changed frame conditions. Along with grave changes in the social organization and production strategies, the livestock numbers increased from 10,300 in 1976 to more than 30,000 in 1991. Since then they have continued to grow. Besides rising livestock numbers the "classical mountain nomadism" ceased to be performed when the structural reforms in post-revolutionary China created production brigades and people's communes by 1958. This move was probably the most severe in terms of victims and changing lifestyles. Kirghiz pastoralists were compelled to live permanently in the Little Kara Köl. The headquarters of the production brigade at Subashi (3,600m) is equipped with familiar infrastructure insti¬tutions and with a veterinary post controlling the quality and health status of animals (Fig. 7). The livestock and its products were delivered to the livestock department at the county headquarter in Aqto (Fig. 6). In return all necessities for life in the pasture settlements were provided at nominal cost. Though very restricted in their movements and decision-making, the Kirghiz secured their basic livelihoods and their living conditions improved. Despite harsh environmental conditions of survival the animals raised in these productive pastures are high-quality products.

The value of the niche production in the Pamirs reached its peak when after 1978 the "production responsibility system" (cf. Fig. 6) was introduced and the Kirghiz gained greater degrees of freedom and leverage power in their own economic activities and marketing. Their livestock compete very well on the profitable markets in the urban oases along the Southern silk route (Tarim basin). Today the Kirghiz are respected as one of the most affluent livestock-breeding communities of the region. Within a few years they have re-established profitable market relations with the Sunday market in Kashgar where affluent buyers purchase their fat-tailed sheep at high prices. In socio-economic terms the Kirghiz of Little Kara Köl fare best among their relatives and neighbours.

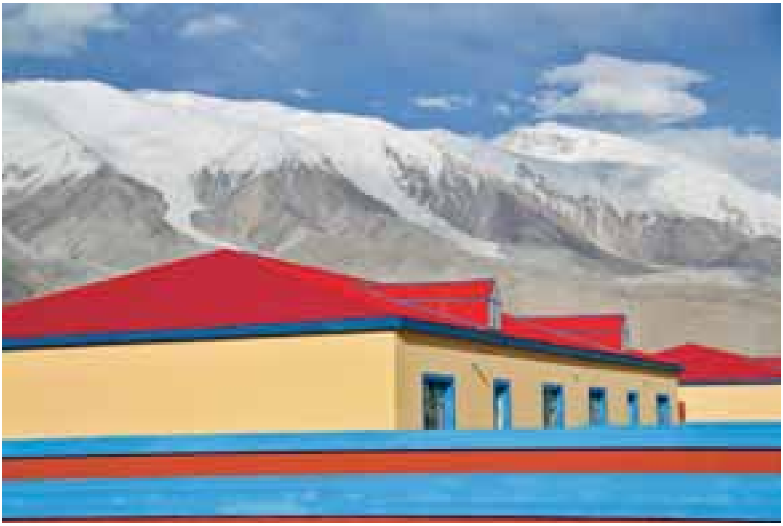

Fig. 8: The new resettlement scheme in Bulunkul (photograph July 19, 2010 © Hermann Kreutzmann)

Nevertheless, development and modernisation never stops. In a major move to improve the living conditions in remote locations including mountain regions the central planning institution have developed so-called "resettlement schemes" that are concentrating infrastructural assets, social amenities, veterinary services and marketing facilities. The rationale provided is firstly the application of economies of scales in the periphery and secondly nature protection by concentrating settlement space and facilities for animal husbandry and fodder production. From 1954 to 2008 the number of livestock in Kizil Su Autonomous Prefecture increased by a factor of 2.8 to app. 1.6 million heads. In the case of Little Kara Köl Pamir this strategy is implemented since 2009 when a new township by the name of Bulunkul was founded. The township aims at providing housing and social infrastructure for all herders' households that are presently scattered in the area of the former people's commune Bulunkul. During the first phase 450 out 1600 households will be resettled in housing schemes that are supported from federal and regional funds as well as from rich cities such as Shanghai (Fig. 8).

Traditional pastoralism cannot give herders the “pleasures of modernization” as Zhao Xichun phrased it in his presentation during the conference. Moving of herders to the foot of the mountains – to agro-pastoral settlements – or to resettlement townships within the mountains – as in the case of Bulunkul – aims at the provision of pastoralists with amenities that allow them “to live in a stable manner and to get rich” (ibid.). Infrastructure assets incorporate “three accesses: water, electricity and roads; four availabilities: herders’ houses, animal sheds, fodder and silage; five support schemes: schools, cultural centres, clinics, shops, technical service stations” (ibid.). Since 2000 the pace of resettlement has been enhanced and a replanning of the function of natural pastures has been undertaken. In this framework Little Kara Köl Pamir has been identified as one of the resettlement schemes that are regarded as “the biggest livelihood projects in Xinjiang”. The ultimate path leads to a transformation of livelihoods that incorporates the “resettlement of herders as labourers in other areas. The remaining herders can engage in pastoralism and economies of scale, increase the market supply and thus increase the pastoralists’ income leading to a modernisation of mountain pastures and the modernisation of pastoralism. Voluntary participation of herders in resettlement programmes is based on hearings at township level, annual sessions of party committees. Wishes can be articulated through proper channels” (ibid.).[27] It will be seen in the near future how the lifestyle, economic position and social organisation of Kirghiz herders might have been changed.

6.4 Nomads on the move: the search for security in exile

The Great and Little Pamir within Wakhan Woluswali of Badakhshan Province (Afghanistan) have been studied extensively up to the repeated and apostrophized “last exodus” of the majority of Kirghiz nomads from there to Pakistan in 1978. Their fate is one of the more prominent cases where border delineation has interrupted traditional migration patterns (Felmy & Kreutzmann 2004, Shahrani 1979).

In 1978, nearly all Kirghiz (inhabitants of 280 yurts) fled to Pakistan. Not all members of the Kirghiz group of Rahman Kul joined his move to Eastern Anatolia after four years of exile in Pakistan. Rahman Kul alone had to leave 16,000 sheep and goats, more than 700 yaks, 15 horses and 18 Bactrian camels behind, while the whole commu¬nity of the Afghan Pamirs possessed more than 40,000 animals. In comparison, the majority of Wakhi subsisted on a much lower economic level. Wakhi farmers utilizing the Pamirs for sum¬mer grazing tried to compete with rich Kirghiz nomads who controlled most of these Pamirs. Some impoverished Wakhi took up jobs as shepherds for Kirghiz herd owners. Eventually, they turned to nomadic strategies, one of the cases where farmers became nomads.

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[27] The quotations are taken from the English simultaneous translation of the presentation by Zhao Xinchun, Deputy Director and Chief Scientist of Animal Husbandry, during the Regional Workshop in Kashgar on July 20, 2010. Cf. the case study by Sha-Zhou An et al. in this volume.

When the Kirghiz left the Pamirs they left their wealth behind. Only a small herd of 6,000 animals could be taken across the high passes to exile in Pakistan and none from there to the later destination in Turkey. Rahman Kul migrated along with his 1,132 Kirghiz followers to Eastern Anatolia in August 1982. The Kirghiz community was established in Kurdish territory as a government resettlement scheme which provided each household with ten sheep and goats as well as three head of cattle. Rahman Kul became the village head of the community in Ulupamir Köyü (1,800 m) where he died in 1990. The leadership was transferred to his eldest son. Presently, this community has grown to 2,000 members following a sedentary agriculture and animal husbandry with their herds of 7,000 sheep, 1,000 goats, 6,000 head of cattle and 70 horses. In recent years there was no sign of their leaving this part of Turkey for an uncertain future in the Afghan Pamirs.

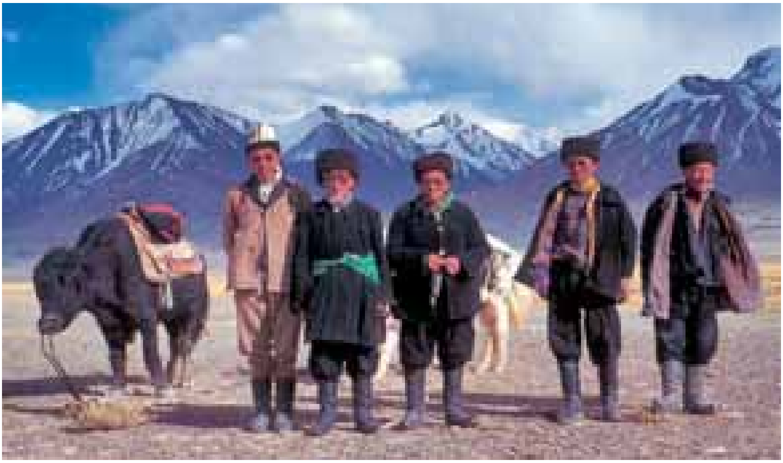

Fig. 9: Abdurrashid Khan (centre) and elders from various Kirghiz camps in Little Pamir (photograph June 10, 2000 © Hermann Kreutzmann).

While in exile in Pakistan, a small group of 200 Kirghiz refused to follow their khan to Turkey and returned to the Afghan Little Pamir from Pakistan by October 1979. Under the leadership of Abdurrashid Khan they established themselves in Soviet-occupied Wakhan and have remained there since (Fig. 9). The community had grown to 102 yurts in Pamir-e Kalan (Great Pamir) and 135 yurts in Pamir-e Khurd (Little Pamir) by 1999. Their number of yaks ranges around

1,400 compared to nearly 9,000 sheep and goats, 160 horses and 90 Bactrian camels. Any form of animal husbandry has been limited to subsistent survival strategies in recent years, as traditional exchange lines have been interrupted due to adverse political conditions. Presently, the Kirghiz are engaged in livestock breeding and in limited barter trade with entrepreneurs from neighbouring Hunza in Pakistan. The itinerant traders supply basic necessities in exchange for yaks and sheep, and livestock products such as wool, hides, yak tails and *qurut*. Nevertheless, humanitarian aid from outside is regularly needed for basic food supplies. Abdurrashid Khan remembers the period of Soviet occupation in the Afghan Pamirs as the most comfortable period of his life. Prospects for the future are bleak, and negotiations with the Government of Kyrgyzstan were started. Up to now, the majority of Kirghiz have refused to leave the fertile Pamir pastures. Among all the Kirghiz groups studied, the least change of survival strategies has occurred here. A basic school was established only recently (Callahan 2006), but no dispensaries and/or hospitals are located in the Afghan Pamirs; neither any bazaars, nor shops. Bartering of livestock products and animal husbandry organized through a migratory cycle between winter and summer camps (sometimes an intermediate camp site is occupied in between) remains the prime occupation of this community.

7 Conclusions

The case studies have shown how in similar ecological settings the welfare of mountain farmers and pastoralists alike is significantly influenced and shaped by external interventions. Over time spatial utilization strategies have been transformed in accordance with the shift of political players and the replacement of stakeholders. Earlier patterns of evasion in the form of leaving spheres of influence in search of safer abodes have become approaches of limited success or have become overall inaccessible strategies. Consequently, adaptation to existing rules and acceptance of influential actors are observable patterns of mountain farmers and pastoralists in the Pamirian knot. In the majority of cases marginalization in a shrinking space has occurred, although in a few cases living standards improved significantly. Modernization has been a mixed blessing. Nevertheless, the path has been followed, and adjustments to it are the challenges of the present and the future. Classical mountain nomadism has only survived in Afghan environments, while the political transformations in the Soviet Union and the PR of China transformed pastoral strategies into a kind of detached mountain pastoralism. In both contexts the general adaptive strategy for utilizing high mountain pastures remained intact even after subsequent reforms and national independence. The socio-political context shifted to a stronger market orientation with higher degrees of differentiation among pastoralists and more degrees of freedom in decision-making. At the same time, less security is provided by state authorities.

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2.3 Panel Discussion: General Trends in Pastoralism in Pakistan, Tajikistan, Turkmenistan and China

Panelists: Ji Hongliang[28], Yodgor Qonunov[29], Muhammad Ismail Zafar[30], Dr. Madhav Karki[31], Khudodod Aknazarov[32]

A few key themes emerged from the introductory panel discussion on pastoralism in the Pamirs. First, the importance of learning from case studies to build on best practices as Daniel Maselli stated "look at the local in order to impact the global." Secondly, the relationship between lowlands and highlands was identified as a primary conservation and development approach, in which highland dwellers are rewarded as custodians of ecosystem services. In the face of globalization and a changing climate, local market linkages and pastures as carbon sinks become increasingly interesting to larger global markets. These apparently strong market linkages have driven pastoralists in Xinjiang to become competitive entrepreneurs, which the government has taken the initiative to support. Comparatively, lack of market access and government support makes it incredibly difficult for pastoralism to meet the daily livelihood needs of pastoralists in Tajikistan and Pakistan.

In Turkmenistan, livestock numbers are increasing generally. However, livestock numbers in mountain regions are decreasing because of livelihood alternatives. Mountain areas are mostly unified pasture, with inadequate water supply and lack of productive land. The government supports the livestock sector through the provision of veterinary care and low interest credits for livestock investments. There is currently no law on the use of pastures and little research on productive and carrying capacity which makes management difficult.

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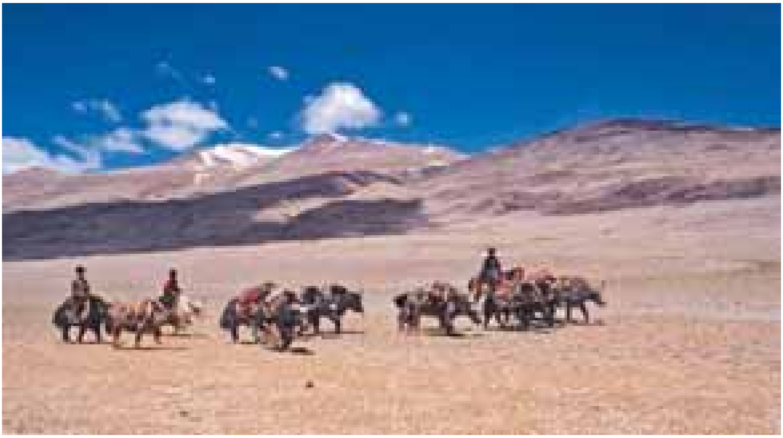

Fig. 1: Kirghiz pastoralists in the Afghan Wakhan on their way to receive humanitarian aid at a central distribution point in Mulk Ali, Wakhan Woluswali, Afghanistan (photograph June 11, 2000 © Hermann Kreutzmann)

Likewise in Tajikistan, after the collapse of the Soviet Union land was distributed evenly among landowners. Pastoralists suffered from a drastic decrease in inputs. Until now, there has been no pasture law, causing land tenure disputes and making long-term planning essentially impossible. Of approximately two million hectares of pastureland, approximately half is designated as 'no-mans' land. The World Bank *Cadastre* project is working on land distribution.

In general, livestock numbers are increasing, but the demand for livestock products does not correspond to this demand and therefore pastoralism is also not a priority of the governments' modernization strategy. Current tax legislation is not conducive to improved pasture management; for example, everyone must pay pasture taxes, no matter whether or not one owns livestock. Above 3000 m in the Eastern Pamir, taxes are not collected, whereas in the Western Pamir, the condition of pastures tends to be much worse, yet everyone must pay taxes. Access to markets is another major problem; transportation from high pasture where processing of livestock products takes place is extremely difficult – to the point that the transportation to the market exceeds the economic benefit from the product. Pastoralists in Tajikistan are finding that a late summer onset is causing to greater degradation due to premature grazing. Finally, strong competition between fuel and fodder contributes to widespread degradation.

Fig. 2: Shepherd returning from the summer pastures to Darkot in the Yasin Valley of Gilgit-Baltistan, Pakistan (photograph September 5, 1990 © Hermann Kreutzmann)

Cross-border grazing and trade with Afghanistan, China and Kyrgyzstan is viewed as a sound management practice. However, the spread of disease is an issue which needs to be addressed through stonger cross-border control. Successful examples of cross-border pasture care are cross-border agro-vet service centres which have been established as a joint effort between MSDSP and AKF-Afghanistan. Tajik veterinarians provide essential services to the most isolated regions of Northern Afghanistan in Darwaz and Murghab/Wakhan.

Pastoralism as a way of life is experiencing a dramatic decline in Gilgit-Baltistan and Chitral. The demographic trend of Northern Pakistan is towards a younger generation, who has little or no interest in pastoralism due to alternative livelihood options. Two main types of pastoral systems exist in the area: a) land-owner pastoralism which is integrated with crop management and b) traditional transhumance. Increasingly, the trend is for land-owners to hire land-less shepherds who will take their livestock to pasture. However, the decreasing use of high pasture is leading to the overuse of lower grasslands, which are also being transformed in areas of cash crop development – leaving less land for fodder production.

The major driving forces of this change, is the shift from pastoralism to other economic acitivities. Greater accessibility to education is discouraging younger generations to retain a pastoral lifestyle. The demographic trend shows that traditionally joint family systems are becoming nuclear units. This translates into overall livestock numbers remaining the same, but the household level the number of livestock has decreased. Decreasing herd sizes lead to reduced pressure on some areas but generally more pressure on close pastures. In response to market forces, there has been a shift from sheep to goat value chains for higher value cashmere wool and milk products. Land tenure is an issue in the sense that there are conflicts between statutory laws and community laws.

In Xinjiang there are 60 million head of livestock and the sector employs 1.6 million people. More than one third of Xinjiang's area is comprised of pastureland. The average annual income of livestock owners is 2400 Yuan which is lower than the average income of farmers. In Xinjiang, the government policy to protect pastures involves decreasing the traditional mobility of both herders and their livestock, which may in fact be decreasing their adaptive ability to cope with sudden change. The resettlement programme is elaborated below in a case study; what follows are general trends and challenges in pastoralism in Xinjiang.

A general consensus among Chinese delegates was that there is a lack of a high-level institution that can coordinate work across all sectors; however, they also identified the lack of a bottom-up model as a challenge. As is the case in Pakistan and Tajikistan, forestry development and animal husbandry are in constant conflict which impedes the development of animal husbandry.

In addition to these institutional challenges, a number of socio-economic challenges impede the further development of animal husbandry in Xinjiang. Despite the rapid development of animal husbandry in Xinjiang, the share of the sector compared to overall GDP remains small. Also, despite overall positive impressions of the resettlement programme, Chinese delegates also raised the issue that herders find it difficult to begin practice of alternative livelihood means, and the government should make greater efforts to provide adequate support and training for the transition from pastoralism to 'modernization.' Due to challenging natural conditions, the cost of living in mountain areas remains high.

Ecological challenges include widespread desertification and degradation due to overgrazing. Many of the degraded lands are irreversible and restoration of pastures is therefore very difficult. It is believed that one irrigated pasture has the productivity equivalent to 20 natural pastures.

In sum, the varying experiences in different countries ask for place-specific programmes and packages in the development sector. Certain frame conditions differ significantly and call for custom-made solutions.

Recorded by Jamila Haider

››› 3 Policies for Mitigating Effects of Climate Change

Daniel Maselli[33]

Abstract

The paper provides an overview of selected policies, strategies and initiatives that address Climate Change issues and challenges at different levels and by different actors with a focus on mitigation and land use in a broader sense.

The overall picture suggests that the global discourse on Climate Change adaptation and mitigation is increasingly politicized and thus shifting from an initial environmental and livelihood centered concern to an object of economic and financial power struggle and interests largely triggered by the pledging and investment of large funds due to the anticipated economic impacts at stake (Stern 2009). As a consequence, efficient targeted policies and strategies that address the direct or indirect causes and impacts of Climate Change in rural and foremost extensive land use systems in the developing world appear to be mostly externally driven, largely inadequate and often even inexistent particularly in the context of Central Asia.

However, while both Climate and Global Change undoubtedly affect pastoralists and their livelihood systems – often but not exclusively in a negative way – and despite the fact that their impact is likely to increase in future, the real challenges and obstacles to a secured or better livelihood may be more inhibited by a widespread negative attitude that translates into a neglect, an under estimation and a marginalization of extensive land use systems by policy and decision makers worldwide. Herders and their animals are often used as scapegoats for failed rural and environmental policies of central governments instead of being perceived as potential partners for mitigation. This highly unsatisfactory situation becomes evident through a general lack of appropriate strategies and instruments that are meant to support mobile herding and their well adapted extensive land use

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systems that have a historically grown intrinsic capability to cope with change acquired over centuries while struggling for survival (MacOpiyo et al. 2008).

Nevertheless or because of this situation, the current high sensitivity for Climate Change issues should be used to correct these negative mindsets and to mobilize the much needed political support and financial resources that would allow to providing the base for a sustainable pastoralism in Central Asia in future. By recognizing that ultimately herders are the real managers and custodians of pastures and high altitude ecosystems that provide a variety of (eco) services vital to a large part of the earth' population, it would be wise to involve them as key actors when devising appropriate local and national strategies and policies not only to increase their ownership and commitment but also to include their knowledge, experience and capacities.

1 Climate Change Mitigation in Development Policies and Strategies

The recognition of Climate Change as a major process that influences development and hinders the achievement of the Millennium Development Goals (MDGs) has increased tremendously over the last decade (UNFPA 2009). More and more government entities, business companies, NGOs as well as society at large have realized that something is going wrong with our climate and that human beings are the major cause for the rapid increase of temperature caused by raising Green House Gas (GHG) emissions. While among certain scientists disputes can still be found regarding the anthropogenic nature of recent rapid climatic changes, a majority does no more question mankind's negative impact on climate through atmospheric pollution (Blair 2008). Many have also realized, that time for action is now if the worst scenarios for the future generations are to be avoided. This includes the need for a fundamental restructuring of the economy oriented towards a low-carbon path (UNEP 2009). In line with this understanding, the political leaders at the Bali UNFCC Conference in 2007 recognized that Climate Change was a serious challenge not only for the environment, but also a threat for future economic prosperity and security since 'waiting is risky and expensive' (Blair 2008).

Along with the recognition of the problem, a multitude of responses have been developed. While this is a positive sign, the large majority of the policies and strategies developed and of the measures proposed or being implemented is focusing on adaptation rather than mitigation (Nellemann & Kaltenborn 2009; eca 2009; ICARDA 2009; WB 2008). While Climate Change adaptation i.e. 'the adjustment in practices, processes or structures to take into account changing climatic conditions, to moderate potential damages, or to benefit from the opportunities associated with climate change' (IPCC 2007) is getting major attention and support, Climate Change mitigation i.e. 'strategies to reduce or remove greenhouse gas emissions from the atmosphere, amongst others by maintaining carbon sinks and switching towards more green energy technologies' (Adams & Luchsinger 2009) are less in the focus in particular for development and transition countries. In Europe, the 'Adaptation and Mitigation Strategies: Supporting European Climate Policy' Project ADAM (2006–2009) helped the European Union to develop a post-2012 international climate regime policy. In Central Asia the International Centre for Agricultural Research in Dry Areas (ICARDA) together with its National Agricultural Research Systems (NARS) partners launched in 2009 a new multi-disciplinary research project on the 'Impact of Climate Change on rural livelihood in Central Asia' that should help identifying promising avenues for Climate Change adaptation. Similarly a range of National Adaptation Programs for Action (NAPAs) have been developed. However, they are often planned outside the national institutional frameworks on poverty reduction and lack to influence the mainstreaming of the wider national policy frameworks.

The intention of adaptation efforts is to increase the resilience and reduce the vulnerability of people and ecosystems to cope with Climate Change and its shocks (Sharma et al. 2009). While this is a necessity on one hand it can on the long run only be considered as fighting the symptoms and not the real causes of Climate Change. Similarly most of the funds invested are meant to help people adapt to the changes and not to avoid further warming and thus in particular glacier melting, sea level raising and more frequent and devastating natural hazards. The required combined response has been summarized as 'avoiding the unmanageable and managing the unavoidable' (SEG 2007) since mitigation can help to reduce the burden on adaptation. The WB has thus launched an appeal to 'act now', 'act together' and 'act differently' in order to allow for an inclusive and sustainable globalization (WB 2010). Herein there is an increasing understanding, that long-run, cost-effective mitigation cannot be achieved without the participation of the developing world (Blair 2008).

Frequently used policies or instruments for Climate Change mitigation include:

- Regulations and standards such as building codes, appliance standards and labels or renewable energy obligations typically applied in the building and energy sectors;
- Taxes or levies on fossil fuels and vehicles – both for purchase and use – typically applied to the transport and energy sectors;
- Tradable permits such as white certificates typically applied in the energy and industry sectors;

- Financial incentives such as feed in tariffs for REN subsidies or tax credits typically applied in the energy and industry sectors; and
- Voluntary agreements with different voluntary measures mainly applied in the industry sector.

One of the heavily debated strategies is to put a price on GHG emissions. Herein two proposed methods prevail: the introduction of a Carbon Tax as a flat rate with unpredictable reduction but simple handling and the more complex 'Cap and trade system' with predictable reduction but also higher fluctuation of prices. The respective Carbon Market has grown exponentially between 2004 and 2008 from 0.7 to 126 billion USD (WB 2009). However, on the other hand the carbon market price has been fluctuation considerably with a general downward trend.

Nevertheless, the general approach to Climate Change still allows in particular the highly developed and industrialized countries to continue living in a 'business as usual' logic that doesn't request a real change of lifestyle, particularly not regarding the high consumption of energy with corresponding high carbon footprints that directs mankind into a carbon-constrained world. In this sense 'adaptation is becoming a euphemism for social injustice on a global scale … the world's poor are being harmed through a problem that is not of their making' as was stated by Archbishop Desmond Tutu (UN 2009). What is needed is a fundamental change in people's or rather mankind's understanding and foremost behaviour including the creation of corresponding new institutions with corresponding 'rules of the game'.

In negotiations such as at the Copenhagen Conference of the Parties in December 2009, the industrialized and the developing countries were debating on who should limit the further emissions of GHG, to what extend and to what costs. No final agreement could be reached under such divergent attitudes and conflicting interests but the quest for 'Climate Justice' was voiced by many representatives on behalf of the large majority of poor and marginalized people on the globe. There is thus a clear need to agree on an equitable and effective 'global climate deal' to avoid further degrading of the earth's atmosphere, a prerequisite to host a growing number of inhabitants on our planet.

2 Instruments Addressing Climate Change Mitigation at Global Level

Among the international initiatives meant to mitigate negative Climate Change impacts at global scale, the multilateral actors play a key role with regard to innovative instruments and investments pledged so far. However, their major challenge lies in developing rules that are acceptable to everyone; herein the liberalization of trade in environmental goods and services (EGS) may be an opportunity to facilitate the transfer of low-carbon technologies (UNEP 2009). In principle the Kyoto Protocol defines three mechanisms i.e. joint implementation, Clean Development Mechanism (CDM), and international emissions trading that allow industrialized countries achieve their emissions targets by reducing emissions or increasing GHG removals in countries where this is more cost effective.

In the multilateral context the Asian Development Bank ADB has taken a pioneering role for the entire Asia region by installing in 2008 its Climate Change Fund CCF with 40 Mio USD administered by the Global Environmental Facility GEF. The goals of the CCF are to reduce GHG emissions and to increase carbon sequestration by helping its Developing Member Countries (DMCs) to achieve energy security and a transition to low-carbon economies through cost effective investments. The CCF supports financial, policy, and institutional reforms as well as the development of appropriate regulatory frameworks that foster clean energy development and energy access for the poor at country level (ADB 2009).

Similarly the World Bank (WB 2009) has through the International Finance Corporation IFC and the Multilateral Investment Guarantee Agency MIGA made efforts to develop Climate Change mitigation strategies with business plans for all regions. This includes carbon growth country studies, GHG analysis tools, and carbon footprint tracking. The WB has further purchased carbon funds by creating two new facilities: the Forest Carbon Partnership and the Carbon Partnership Facility. It has also established the Climate Investment Fund CIF and the Clean Technology Fund CTF. The WB is making efforts to mainstream Climate Change into the core development and poverty reduction strategies, policies and operations of the WB Group. It has its own Bank Carbon Finance Unit (CFU) to support implementation by selling emission reductions to increase the 'bankability of projects' (WB 2008, WB 2010).

In order to mitigate Climate Change impact there seems to be a general agreement, that technology transfer to developing countries shall constitute a critical component of any post-2012 climate regime as it provides incentives for emerging economies and other developing countries to enhance their mitigation efforts (UNEP 2009). Through a 'Clean Technology Investment Plan for Kazakhstan' (CIF/WB 2010) concrete proposals are elaborated to reduce GHG emissions. The sectoral policies, measures and instruments shown to be environmentally effective listed as examples by the IPCC (2007) indicate a mitigation potential in agriculture through improved land management (e.g. more efficient use of fertilizers and irrigation water) and financial incentives that allow to maintain or increase soil carbon content. With regard to forests and forestry the measures aim at maintaining or increasing the forested area by reducing deforestation, improved forest management and enforced land-use regulations. Herein the 'Reducing Emissions from Deforestation and Forest Degradation' (REDD) UN-Initiative is an effort to 'create a financial value for the carbon stored in forests, offering incentives for developing countries to reduce emissions from forested lands and invest in low-carbon paths to sustainable development' whereas the 'REDD+' Initiative 'goes beyond deforestation and forest degradation, and includes the role of conservation, sustainable management of forests and enhancement of forest carbon stocks' (Angelsen et al. 2009). The major constraints in forest and forestry management are however land tenure issues and a general lack of investment capital.

3 Green House Gas Emissions in Central Asia

Climate Change mitigation requires efforts to effectively reduce the pollution of the atmosphere that triggers the green house effect. The major sectors concerned are thus the ones that produce GHG namely CO^2, Methane and Nitrogen. This involves all types of burning processes through fuel carriers such as oil, gas, coal and wood in particular. It also involves other sources of GHG production such as agriculture where e.g. irrigated rice, fertilizers, and livestock are involved in Methane emissions. Herein the Central Asian countries have in average performed rather well by reducing their overall CO^2 emissions from 630 to 530 million tons from 1990 to 2005 wherein Kyrgyzstan and Tajikistan are holding the lowest CO^2 production in the region with 1–2 tons per person and year (zoï 2009). While this national performance is mainly due to the fact that most of the energy consumed in both countries stems from hydropower with only a modest contribution by fossil fuels, the overall positive regional 'performance' is clearly due to the economic shock after the disintegration of the Soviet Union that led to a collapse of many industries and hampered economic growth over years.

However, with the expected recovery and further economic development of the region consumption levels are most likely to rise considerably. Jointly with the very ineffective heating systems and the import of old transport means such as cars and trucks from abroad, CO^2 emissions per capita must be expected to increase dramatically if no appropriate measures are taken. In addition the expected population growth will further contribute to a significant increase of total GHG emissions in Central Asia.

The picture is a bit different for the energy rich Kazakhstan where coal and increasingly oil are the dominant energy carriers as well as for Uzbekistan and Turkmenistan where natural gas consumption prevails. There the per capita CO^2 release is currently 10 to 20 times higher than in Kyrgyzstan and Tajikistan. Given the differences in the magnitude of population and surface, the disparities in total GHG emissions among the Central Asian countries are even much larger. The Climate Change mitigation needs, potential opportunities and efforts in the region have to be considered on this background.

With the goal of sustainable development and poverty reduction it is though important to recognize the pivotal role of energy linked to Climate Change. Energy services are a key factor enabling development AND triggering Climate Change. The access to and use of energy is directly linked to several MDGs such as water ('no water pumping without energy'), health ('no clean air with old and inefficient stoves') or gender equity ('no girl education when forced to collect firewood'). Consequently policies and strategies need to focus on the reduction of energy consumption and on the promotion of less climate harming energy carriers in particular renewable energy sources such as hydropower, wind power, biomass combustion and solar energy. In order to achieve the set goals of GHG reduction there is an undeniable need to fundamentally restructure the energy supply and utilization policies and strategies that go beyond 'business as usual' transformations.

4 Targeted Climate Change Mitigation Efforts in Asia

According to ADB (2007) half of the GHG emissions in Asia are linked to energy. However, a large part of the remaining other half is caused by fugitive emissions and land use changes. This calls for efforts addressing all three major sources in which energy efficiency improvements and low-carbon solutions can help mitigate energy-related emission impacts. In order to address this issue ADB has a Clean Energy and Environment Program with the 'Energy Efficiency Initiative' (EEI), the 'Carbon Market Initiative' (CMI) and the 'Sustainable Transport Initiative' (STI) as flagships. In order to address the fugitive emissions, ADB promotes the capture and utilization of Methane stemming from coal-mines, agricultural waste, landfills and gas transmission pipelines. ADB joined the 'Methane to Market' Partnership' (M2M) in 2006 that strives at capturing methane as energy carrier. In order to address the negative impacts of land use changes on GHG, efforts are being undertaken to protect forests and improve their sustainable utilization. So far no specific policy or intervention strategy has addressed livestock as a relevant source of GHG emission or pastures as possible carbon sequestration surfaces. There is thus a clear need to clarify the future role of livestock and pastures in Central Asia.

5 Opportunities for Climate Change Mitigation in Central Asia

Given the particular historical, socio-political and economic background of the former Soviet Republics in Central Asia, Climate Change mitigation opportunities differ somehow from other neighboring countries in South or South East Asia despite some comparable bio-physical features such as the mountainous terrain and remote rural character of large parts of the territory.

Based on the former centralized system, out-fashioned large scale housing construction and dilapidated distant heating infrastructure in cities provide a huge opportunity for CO^2 reduction by introducing more energy efficient housing insulation and heating as well as increasingly also respective cooling systems both in public as well as private buildings. This applies both to the rehabilitation of existing old as well as new constructions.

Another avenue for CO^2 reduction lays in the transportation system where outdated high fuel consuming cars and trucks are imported from various industrialized countries. Jointly with ill maintenance they contribute to severe air pollution in cities and urban centers as well as along the main transportation roads across the countries. By introducing more efficient public transport means with low-carbon technologies, a considerable reduction could be achieved. Similarly, the industrial production of coal and other energy carriers offers the opportunity to introduce more efficient and climate friendly technologies. However, given the economic situation especially in the two poorest countries i.e. Tajikistan and Kyrgyzstan, such technological innovations will strongly depend upon external support. Herein the EU Strategy for Central Asia provides a possible avenue to explore such support (EU 2009).

In all cases, the Central Asian countries – and in particular the two most vulnerable and poor ones – represent a potential Carbon Trade market where comparatively modest foreign investments could help to achieve a considerable improvement. Such an effort would have multiple benefits by promoting economic development and contributing to socio-political stability in this fragile region. However, the diffusion of 'climate-smart technologies' requires to build up respective absorptive capacity and the public and private sectors to be ready to 'identify, adopt, adapt, improve, and employ the most appropriate technologies' to avoid repeating mistakes made in other regions of the world (WB 2010).

Furthermore there is a general understanding, that the pledged funding under the UNFCCC and the Kyoto Protocol 'represents only a small percentage of the anticipated mitigation and adaptation needs of developing countries'; without a significant change the developing and transition countries will not be able to afford making commitments beyond defined policies and measures (UNEP 2009).

Overall it seems that the potential for Climate Change mitigation has hardly been tapped in a systematic and proactive manner in many places and cases. There is a clear need to shift the paradigm from complaining and blaming towards efforts allowing to increase and to better capitalize on opportunities. Herein the great wealth of experiences accumulated over centuries by various rural communities that were forced to adapt to a highly variable climate may provide avenues both for adaptation and mitigation e.g. in the field of water management through soil and water conservation approaches and technologies (ICIMOD 2009; WOCAT 2007).

6 Facing Climate Change and Global Change Mitigation in Pastoral Settings

In the frame of Climate Change, agriculture is often perceived as a field requiring foremost adaptation efforts and support while a shift e.g. to organic agriculture would have the potential to help mitigate Climate Change since it is less carbon-intensive. Similarly pastoral land use system as mainly perceived as contributing to Climate Change rather than having the potential for Climate Change mitigation. Avenues to reduce Methane production by ruminants are being explored but may not be that easily implemented (Martin et al. 2008). Nevertheless, many studies demonstrate that pastoralism can play an important role in carbon sequestration. However, the number of policy options to improve livestock an pasture management as a means to mitigate GHG emissions appears to be significantly lower than for other potential mitigation domains such as agriculture or waste management – not to speak about the manifold adaptation options elaborated and put forward in reports and policy papers (WB 2008).

However, a range of major obstacles have been identified that hamper pastoral land use systems to enter the carbon market. A key obstacle relates to the economic feasibility of improved rangeland carbon management practices such as high initial costs, inequalities among households to access benefits, and high variations of incentives due to fluctuations of per ton of CO^2 remuneration. Another key obstacle is linked to institutional constraints such as large contiguous pastoral areas requiring institutions that aggregate mobile households or the lack of clear and enforced land tenure rights as well as the difficulty to draw sharp project border lines that are respected by outsiders, too. Finally the capacity and readiness to finance carbon in rangeland is limited due to an insufficient awareness and understanding of the mitigation potential of rangelands both at international and national level while among potential project developers there is a limited understanding of the market opportunities related to pastoral land. Last but not least, the costs for developing pioneer projects and new methodologies in this domain are very high. Moreover, when it comes to appropriate rangeland management practices that are conducive to increase carbon storage in the soil, site-specific practices are required and scaling-up is not simple (Tennigkeit & Wilkes 2008).

Currently the best available estimates suggest that an improved rangeland management has a biophysical potential to sequester 1300–2000 MtCO^{2}e worldwide up to 2030. Unfortunately so far rangeland management activities – with the exception of afforestation and reforestation – are not eligible under the CDM and most pre-compliance systems; hence at present the only purchasers of rangeland carbon credits are to be found in the voluntary market (Tennigkeit & Wilkes 2008).

In order to improve this situation some critical recommendations have been put forward. This includes the establishment of a rangeland or pasture trust fund with the objective of developing clusters of pilot projects focusing on improved rangeland management for carbon sequestration. Another recommendation addresses the insufficient recognition of the role rangeland management in climate change mitigation and adaptation policy development processes at national and international levels. A third recommendation calls for more updated and more easily accessible data on pastures and rangelands and they capacity to sequestrate carbon. Finally, special attention needs to be paid to the danger emanating from a negative impact on pastoralists' grazing rights due to mindsets where such extensive land use systems are considered as non-productive, of little economic value, and environmentally destructive topped with the prejudice that pastoralists are backward people (Tennigkeit & Wilkes 2008).

Finally one has to recognize that without external support, the pastoral livelihoods in marginal and remote areas such as in particular the high altitude rangelands in Central Asia and the Tibetan Plateau may face serious difficulties due to Climate Change impacts such as prolonged drought periods, increased variability and shifts in rain patterns or reduced biomass production. The anticipation of possible negative impacts and the development and implementation of effective adaptation and mitigation strategies are thus key to sustain future pastoral livelihoods. It is the responsibility of those who are contributing most to GHG emissions and who are leading a comparatively easy modern lifestyle to show a sense of responsibility and to practice solidarity for the benefit of all.

7 Recognizing the Role of Local Communities as Key Actors

There is an increasing awareness that local actors have to play a key role foremost in Climate Change adaptation but also in Climate Change mitigation efforts. However, this requires additional external support to promote innovation and to facilitate low carbon investments e.g. by developing, transferring and diffusing climate-friendly technologies. Ultimately the policies and strategies needed require the involvement of the target groups in order to validate and create ownership – a fundamental prerequisite for successful implementation. Given the fact, that more young people than ever before are populating the planet on the eve of Climate Change triggered events that will most probably affect them during their entire life, efforts to capacitate and involve youth in responding to Climate Change is crucial (UNFPA 2009). This includes awareness rising and the promotion of behavioural change as suggested by UNEP's 'Kick the habit' (2009) approach where negative patterns of consumption are challenged in order to shift towards a more climate friendly behaviour.

With regard to marginal rural population the good news for policy and decision makers is, that in developing and transition countries there is a potential both to mitigate Climate Change and to adapt to its negative effects through improved and adapted natural resource management. Examples here for are the capacity to buffer weather extremes and to store carbon in degraded soils, to reduce the negative impact on river flow by conserving or increasing headwater forest cover to sustain dry season flows in downstream areas, or to respond to changes in rain patterns and increased glacier melting by applying good water management particularly in agriculture (NCCR North-South 2009). A key factor to enable rural communities to face Climate Change in an effective manner and to forge consensus will be the building up of social capital and the creation of relationships; herein community organizations and local NGOs can play an important role, in particular where they are influential with respect to access to resources (MacOpiyo et al. 2008). Ultimately the efforts should lead to the understanding, that herders and rural communities at large in pastoral areas are the real and effective custodians of the natural resources. This needs to be recognized by involving them in designing and deciding upon future policies and strategies for the sustainable use of the environment in extensive land use systems such as the pastures in Central Asia.

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››› 4 Central Asian Pastoral Systems in Transition

4.1 Recent Changes in Pastoral Systems. Case Study on Tajikistan

Yodgor Qonunov[34]

1 Background

The Pamir Mountains are located in the most mountainous area of the Republic of Tajikistan and occupy 637,000 thousand km² of land, accounting for 44.6% of the total area of the Republic. This mountainous zone is covered by varied landscapes including sub-tropic, alpine, eternal snows and freezing high-altitude deserts, where valleys alternate with steep, rising mountains. It is in this zone that the highest mountain systems converge – the Tien Shan, the Hindukush, Kun-Lun and the Karakoram. The area is isolated from both the humid cyclone air-streams from the west and the atmospheric precipitations formed by monsoon winds in this part of Asia.

In the Gorno-Badakhshan Autonomous Region (GBAO) that occupies nearly half of the total area of the Republic, pastoralism is the main pillar of the rural economy, based chiefly on natural grazing pastures.

The alpine and sub-alpine pastures of the Pamirs constitute around 1.2 million hectares and are located 2,000 to 4,500 thousands meters above sea level, with the corresponding combination of climatic, grazing and other conditions. On these pastures, it is difficult to maintain cows, sheep and horses in the summer-time, and it is practically impossible to do so successfully in the wintertime. Despite the specific conditions of the landscape, including the steep slopes, the poor soil quality due to the plethora of stones, and the deeply-incised, shady valleys, the hay meadows and pastures of the mountainous districts of the GBAO have been a reliable source for the production of nutritious and cheap fodder for the breeding of pasture animals. When utilized efficiently the hay meadows and pastures of the region can produce between 80,000 and 100,000 tons of fodder annually. Currently, however, only 55–60% of this fodder production is being utilized. Many remote mountain pastures produce up to 60–70% livestock products per annum.

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[34] Inspection Unit Manager, Natural Conservation Department, Government of GBAO.

Along with the above, the lack of regular maintenance and unsystematic utilization of natural fodder-producing lands, especially in the winter pastures, has resulted in the pastures low level of productivity of 0.5–0.6 hectare in dry weight from one hectare. This has contributed to the degradation of the green coverage and has delayed further development of breeding in the area.

Based on the data provided by the Committee on Land Utilization of the GBAO, there are a total of 750,670 hectares of land under pasture (Table 1). Of this land, 112,491 hectares are state-owned; 18,948 hectares are under the reserve of the Forestry Department, and 116,943 hectares of land have been dedicated as specially protected areas or areas of untouched nature. 1,702 hectares of land are covered by industrial facilities, including communication and roads. The vast majority of the pasturelands, 500,586 hectares or 67% out of the total area are attached to agricultural production facilities. Further breaking down this area of agricultural production facilities, they report that 408,722 hectares of land are utilized by farming households, 272 hectares of land are used as kitchen gardens, and 76,360 hectares of land are used by the state-owned agro-industrial enterprises of the region.

2 Climatic Conditions of the Pamir Mountains

The climatic peculiarities of the Western Pamirs are characterized by a wide diversity of conditions, but generally they include low temperatures, intensive insolation, low levels of precipitation, thin air, a short growing period and the pre-dominance of a significant microclimate.

The air temperature at the Yol station (1,283 m above sea level) reaches 10 degrees Celsius or higher 221 days of the year. This stands at only 166 days for the station at Ishkashim (2,525 m above sea level), and 44 days for the station at Burunkul (3,744 m above sea level). The winter lasts 170–190 days at altitudes of around 3,200 m above sea level.

The lowest minimum temperatures reached are generally between -22 and -49 degrees, though they can sometimes reach even lower. At altitudes of 1,700–1,800 m above sea level precipitation consists of 180–200 mm, whereas at altitudes of 2,500–3,400 m annual precipitation is lower and drying out of the towards efforts allowing to increase and to better capitalize on opportunities. Herein the great wealth of experiences accumulated over centuries by various rural communities that were forced to adapt to a highly variable climate may provide avenues both for adaptation and mitigation e.g. in the field of water management through soil and water conservation approaches and technologies (ICIMOD 2009; WOCAT 2007).

6 Facing Climate Change and Global Change Mitigation in Pastoral Settings

In the frame of Climate Change, agriculture is often perceived as a field requiring foremost adaptation efforts and support while a shift e.g. to organic agriculture would have the potential to help mitigate Climate Change since it is less carbon-intensive. Similarly pastoral land use system as mainly perceived as contributing to Climate Change rather than having the potential for Climate Change mitigation. Avenues to reduce Methane production by ruminants are being explored but may not be that easily implemented (Martin et al. 2008). Nevertheless, many studies demonstrate that pastoralism can play an important role in carbon sequestration. However, the number of policy options to improve livestock an pasture management as a means to mitigate GHG emissions appears to be significantly lower than for other potential mitigation domains such as agriculture or waste management – not to speak about the manifold adaptation options elaborated and put forward in reports and policy papers (WB 2008).

However, a range of major obstacles have been identified that hamper pastoral land use systems to enter the carbon market. A key obstacle relates to the economic feasibility of improved rangeland carbon management practices such as high initial costs, inequalities among households to access benefits, and high variations of incentives due to fluctuations of per ton of CO^2 remuneration. Another key obstacle is linked to institutional constraints such as large contiguous pastoral areas requiring institutions that aggregate mobile households or the lack of clear and enforced land tenure rights as well as the difficulty to draw sharp project border lines that are respected by outsiders, too. Finally the capacity and readiness to finance carbon in rangeland is limited due to an insufficient awareness and understanding of the mitigation potential of rangelands both at international and national level while among potential project developers there is a limited understanding of the market opportunities related to pastoral land. Last but not least, the costs for developing pioneer projects and new methodologies in this domain are very high. Moreover, when it comes to appropriate rangeland management practices that are conducive to increase carbon storage in the soil, site-specific practices are required and scaling-up is not simple (Tennigkeit & Wilkes 2008).

Currently the best available estimates suggest that an improved rangeland management has a biophysical potential to sequester 1300–2000 MtCO^{2}e worldwide up to 2030. Unfortunately so far rangeland management activities – with the exception of afforestation and reforestation – are not eligible under the CDM and most pre-compliance systems; hence at present the only purchasers of rangeland carbon credits are to be found in the voluntary market (Tennigkeit & Wilkes 2008).

In order to improve this situation some critical recommendations have been put forward. This includes the establishment of a rangeland or pasture trust fund with the objective of developing clusters of pilot projects focusing on improved rangeland management for carbon sequestration. Another recommendation addresses the insufficient recognition of the role rangeland management in climate change mitigation and adaptation policy development processes at national and international levels. A third recommendation calls for more updated and more easily accessible data on pastures and rangelands and they capacity to sequestrate carbon. Finally, special attention needs to be paid to the danger emanating from a negative impact on pastoralists' grazing rights due to mindsets where such extensive land use systems are considered as non-productive, of little economic value, and environmentally destructive topped with the prejudice that pastoralists are backward people (Tennigkeit & Wilkes 2008).

Finally one has to recognize that without external support, the pastoral livelihoods in marginal and remote areas such as in particular the high altitude rangelands in Central Asia and the Tibetan Plateau may face serious difficulties due to Climate Change impacts such as prolonged drought periods, increased variability and shifts in rain patterns or reduced biomass production. The anticipation of possible negative impacts and the development and implementation of effective adaptation and mitigation strategies are thus key to sustain future pastoral livelihoods. It is the responsibility of those who are contributing most to GHG emissions and who are leading a comparatively easy modern lifestyle to show a sense of responsibility and to practice solidarity for the benefit of all.

7 Recognizing the Role of Local Communities as Key Actors

There is an increasing awareness that local actors have to play a key role foremost in Climate Change adaptation but also in Climate Change mitigation efforts. However, this requires additional external support to promote innovation and to facilitate low carbon investments e.g. by developing, transferring and diffusing climate-friendly technologies. Ultimately the policies and strategies needed require the involvement of the target groups in order to validate and create ownership – a fundamental prerequisite for successful implementation. Given the fact, that more young people than ever before are populating the planet on the eve of Climate Change triggered events that will most probably affect them during their entire life, efforts to capacitate and involve youth in responding to Climate Change is crucial (UNFPA 2009). This includes awareness rising and the promotion of behavioural change as suggested by UNEP's 'Kick the habit' (2009) approach where negative patterns of consumption are challenged in order to shift towards a more climate friendly behaviour.

With regard to marginal rural population the good news for policy and decision makers is, that in developing and transition countries there is a potential both to mitigate Climate Change and to adapt to its negative effects through improved and adapted natural resource management. Examples here for are the capacity to buffer weather extremes and to store carbon in degraded soils, to reduce the negative impact on river flow by conserving or increasing headwater forest cover to sustain dry season flows in downstream areas, or to respond to changes in rain patterns and increased glacier melting by applying good water management particularly in agriculture (NCCR North-South 2009). A key factor to enable rural communities to face Climate Change in an effective manner and to forge consensus will be the building up of social capital and the creation of relationships; herein community organizations and local NGOs can play an important role, in particular where they are influential with respect to access to resources (MacOpiyo et al. 2008). Ultimately the efforts should lead to the understanding, that herders and rural communities at large in pastoral areas are the real and effective custodians of the natural resources. This needs to be recognized by involving them in designing and deciding upon future policies and strategies for the sustainable use of the environment in extensive land use systems such as the pastures in Central Asia.

8 Acknowledgements

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The lowest minimum temperatures reached are generally between -22 and -49 degrees, though they can sometimes reach even lower. At altitudes of 1,700–1,800 m above sea level precipitation consists of 180–200 mm, whereas at altitudes of 2,500–3,400 m annual precipitation is lower and drying out of the soil, of the flatlands begins at the onset of March. At these higher altitudes grey soil, dark and mountainous soil and light-brown, highland desert-plain soil are most visibly present.

The climate of the Eastern Pamirs is a high-mountainous desert, ultra-continental with extraordinarily sharp daily and annual fluctuations of temperatures, characterized by extreme dryness and severity.

Fig. 1: The Pamir Mountains of Tajikistan pose an asset and a challenge at the same time (photograph August 20, 1999 © Hermann Kreutzmann)

The reserves of heat and moisture are very small. In Murghab, the heat summation of days above 10 degree Celsius is only 1000–1003° centigrade, which would modestly provide for the growth of some cereals up to an altitude of 3,500–3,600 m above sea level. This altitude is significantly higher than that in other agro-ecological regions. The winters are cold and severe with low levels of snowfall, gusting winds and freezing temperatures.

3 Land Tenure Systems under the Soviet Union and in the Transition Period

Throughout the time when Tajikistan was a part of the Soviet Union, the command economy was the principal feature of administration. The State structure was organized so that separate spheres of production were defined. Access to seasonal pastures, as well as utilization practices shifted. Special attention was paid to improving the conditions of the natural grazing grounds. This included improving the productivity of the pastures through different means, such as creating directed irrigation channels and providing organic and mineral fertilizers to the land depending on the acidity of the soil.

Herding was common in the Pamirs, with 37,000 heads of big animals and 160,000 small domestic animals being maintained on the pastures. The development of pastoralism in the GBAO was supported by the input of fodder from other Soviet nations and the quality veterinarian services provided. For each domestic animal there was 1.5 kg of concentrated nutritious fodder and an additional 15% reserve of rough fodder were allocated, which adds up to 2.5 tons per hypothetical head of cattle in the Western Pamir and 300–350 kg of rough fodder in the Eastern Pamir during Soviet Union time.

Since 1991, in connection with the disintegration of the Soviet Union, the widening gap in the economic relations among the former Soviet Republics and the impact of the civil war have led to a sharp decline of 30–40% in the productivity of the pastures. It has also led to a proportional decrease in the number of heads of domestic animals in these areas (Table 1). In the western part of GBAO, in the Village of Saghirdasht, only 3,000 heads remained out of 37,000 after civil war in the country.

Structural changes in the rural economy in Tajikistan, and in particular in the GBAO, led to a somewhat ineffective management of pastoral land assets. Simply stated, access to summer pastures was limited and consequently there was a rapid decline in the productivity of the winter pastures, leading to their inefficient utilization. The reason behind this is that small-scale farming rarely allows for the transportation of pasture animals to highland summer pastures. This setup results in the long-term breeding of pasture animals only in spring-autumn-winter pastures, leading to increased pressure on pastoral land assets. This pressure and stress on the pastures has caused a loss in the amount of green cover, or valuable nutri-tious fodder available there.

Table 1: Number of cattle in the districts of the region from 1990 to 2008

	1990	1992	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Darwaz	3,712	7,652	6,933	9,108	9,245	9,548	9,760	9,872	9,926	10,012	10,098	10,461	8,755
Vanj	2,738	7,402	7,990	10,904	11,797	12,091	12,623	12,882	13,062	13,673	14,183	14,640	15,040
Rushan	2,979	7,736	7,391	6,904	6,938	6,948	7,258	7,636	7,681	8,032	8,057	8,328	8,403
Shognan	9,844	14,430	13,062	15,230	17,335	20,559	23,388	23,839	23,938	23,948	24,114	24,391	24,876
Roshtqala		11,235	9,892	10,061	12,346	12,671	12,687	12,701	12,705	12,733	13,260	13,388	13,569
Ishkashim	7,991	9,985	9,271	12,342	10,112	10,223	10,424	10,515	10,705	10,832	12,187	12,436	12,604
Murghab	10,680	14,621	15,503	13,756	13,883	13,981	14,090	11,832	12,024	12,385	12,628	15,924	16,364
Khorog		824	879	1,067	1,621	1,887	1,988	2,009	1,995	2,004	2,014	2,025	235
GBAO	39,665	73,885	70,901	79,372	83,277	87,908	92,218	91,286	92,036	93,619	96,541	101,593	101,646

Source: Data given have been provided from Statistical Committee, 2009

4 The Contribution of the Government of the Republic of Tajikistan to the Development of an Agro-Industrial Complex

Tajikistan is known as an agro-industrial country. The Government of the Republic of Tajikistan pays special attention to the development of the agro-industrial sector, and allocates numerous grants and agricultural loans in this field. Thus, for the period from 2005 to 2010, a total of 21,977,532 TJS were provided in loans for animal husbandry. Subject to the Government Resolution №542, dated November 2, 2007, a Yak-Breeding Development Program was designed for 2008–2015 to focus on the transportation, preparation and sale of this special breed of animal. The purpose was to acquire a special breed of yaks in order to meet consumer demand. Annually, financial means are allocated for the development of yak-breeding, namely, the acquisition of special breeds of yaks and enlarging the area of animal husbandry in the Republic of Tajikistan.

Sixteen agricultural projects have been designed and exhibited in cooperation with the People's Republic of China, with the express purpose of obtaining loans from the funds provided through the Shanghai Treaty Organization. Out of these projects, 2 were allocated long-term loans totalling 180,000 TJS: one for developing chicken-rearing and one for bee-keeping. In order to prevent further uprooting of teresken (*Krascheninnikovia ceratoides*, a dwarf shrub mainly used for fuel purposes) in the Eastern Pamirs the GBAO Nature Protection Department has been allocating money for the purchase of coal in the last four years.[35]

5 Current Management of Pastures and the Development of Livestock-Breeding

According to data from a science-based system of monitoring the agricultural economy in the Pamirs 96.4% of the area (757 thousands hectares) consists of pastures. A significant decline of the green cover, low harvests, and predominance of rough and nearly indigestible fodder during the winter season and a predisposition of extensive usage of the field are problems that are being faced in this region. This results in the exploitation of pastoral areas located in the central part of the mountain range in order to meet the requirements for animal fodder.

In the summer pastures livestock grazing begins in the middle of June and lasts until mid-September, after which the animals are taken to the winter pastures. These pastures are situated on the wide valleys between the hills and in gorges among the mountains.

Early spring is a critical time for the animals, as the winter pastures have not yet grown but driving the animals to the lowlands is not yet possible.

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35 Cf. Samimi et al. 2009 for an assessment of ecosystem services in the Eastern Pamirs.

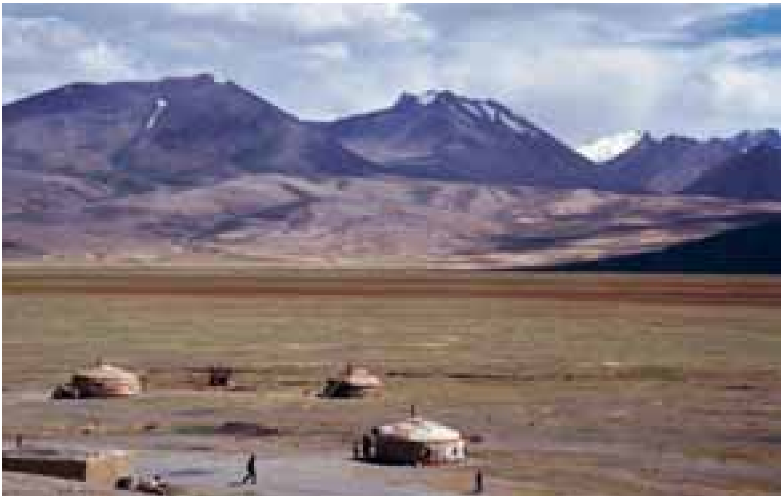

Fig. 2: The fertile pastures in Alichur in the Eastern Pamirs of Gorno-Badakhshan, Tajikistan are easily accessible (photograph August 11, 1999 © Hermann Kreutzmann)

During the second half of June the larger bulk of the animals – yaks, sheep, and goats – are driven out of the valleys to the slopes of the river tributaries, where grazing takes place until the first half of September. Natural pastures being used as the only available source of food for animals has forced people to resort to private and long-distance transhumance nomadism. Observations showed that in the course of a year the location of temporary stopping stations and grazing grounds changed no less than 10 times. Distances of 5–10 km and even up to 50 km were traveled. Preparation is necessary for such movement and involves setting up Yurts and other activities. The duration of time spent grazing in each location is determined taking into consideration the productivity of the specific pastures. A loss of live weight due to maintaining the animals exclusively on the grasses of the foothills has been observed among all species of animals, but the magnitude of this loss depends on the degree of the adaptation of the animals to the over-exploitation of the winter pastures.

5.1 Factors contributing to the effective management of pastures

- The mobility of domestic animals in the Eastern Pamirs, especially in Jawshangoz and Kuytezak is as high as previously, with the small exception of pasture animals in Jawshangoz moving to remote summer pastures every year.

- Major owners keep their animals in good shape. They have permanent usage rights to the pastures and they reduce the number of heads of animals they have in the autumn in order to be able to feed them during the long winters.
- Shepherds of public herds are not always passive participants receiving pasture animals. In some cases, it is the shepherd who organizes the rent of the pastures, collects taxes for the use of pastures and controls the overall size of the herd. He controls the numbers because if he does not bring back the animals in sound condition he will not be trusted with the herd next year.
- In the Eastern GBAO, especially in Jawshangoz, the herds are still small in size. During the Soviet times, the average size of a herd in the summer season was around 1,000 heads of small domestic animals, while the average number today is 450 heads.
- Generally, the pastures are used as follows: in the summer animals are brought from Khatlon Region to Taweeldara District and in the winter the herders of Taweel-dara move back to Khatlon Region. In the Village Council of Saghridasht, in the Western part of the region, state farms and major farming households conducted negotiations about land use with the Local Government of Darwaz District, GBAO. Private economic units from individual districts such as Muminobod and Panj have access to pastures only with the authorization of the State Farm Administration. Communities often create special agreements with individual herders and private owners in order to have access to the pastures in the Eastern or Western Pamirs. In the majority of villages, access to the pastures of the nearby valley is easy.

5.2 Factors threatening the good management of pastures

- In the western part of the GBAO, particularly in Saghridasht the size of the herds are still somewhat large, corresponding to the norms of Soviet times, despite the fact that the total number of animals is low.
- Some of the animals that are used for milk are grazed on the pastures around the village all year-round, which has resulted in serious degradation of the pastures, as was observed in Saghridasht. This is despite the high degree of mobility of the domestic animals that is normally seen.
- In some areas of the Eastern Pamirs, the number of locations used as grazing grounds throughout the year decreased because the animals remained in the spring-autumn pastures throughout the year without moving to the high-land pastures in June. Additionally, a relatively small portion of animals are nowadays driven in the summertime to Jawshangoz, due to transportation difficulties and concerns about the dangers on the road in Roshtqala District.

Therefore, it is possible that the concentration of animals is comparable to what was seen in Soviet times in the lower parts of the valley.

- In Jawshangoz, desolate regions located around Turumtay-kul Lake are not exploited as pastures because of the presence of poisonous plants such as *astragal* or *lindelophia* that would lead to the loss of animals. In some places, the local herders find and liquidate these poisonous plants.
- Some pastures of Saghridasht still remain mined, thus forcing the herders to seek other places for the animals to feed, which sometimes leads to conflicts with other users.
- In the opinion of a number of respondents the winter pastures in Jawshangoz have been exploited to their limit, and it is impossible to graze animals there for the rest of the season. These pastures may be most exposed to degradation.
- In the western part of the GBAO, especially in Saghridasht, the largest threat to pastures is land cultivation. In the first years after the soil is ploughed the land remains naked or overgrown with marshes. It can take up to 20 years for the pastures to regenerate.

5.3 The condition of natural fodder crops area in the GBAO

Animal-breeding in the GBAO is one of the main pillars of the rural and public economy. Its direct development depends on the strength of the food base. At present, out of the total number of the animals in the region between 75% and 95% are being provided with animal food from natural pastures. However, in the main, the pastoral land assets are located in difficult mountainous locations.

In our region, two classes of pastoral land assets are distinguished on the basis of natural-climatic conditions and that of plantation cover (natural) as follows:

(i) Mountain-desert origin on mountainous black-soil lands, brown and chestnut (colored) soils.

(ii) Mountainous half-desert on light chestnut color, light and grey mountains types of soils which are in turn divided into three sub-categories: of plain origin, of desert-plain origin and of steppe origin.

Of the two classes of fodder land assets listed above, 79% of the region consists of mountainous half-desert pastures. Based on their climatic characteristics, mountainous grazing lands are extraordinarily varied in composition.

Only insignificant cultivation areas exist and those are concentrated in the north-western part of the region (in Darwaz District in the Saghridasht and in the eastern part of Murghab District on the banks of the rivers and lakes. Pastoral lands are represented mainly in dry valleys, 92%.

Depending on the ecological conditions and the state of the economy, the vegetation of natural grazing land consists of thorny bushes and grasses of varied composition, whereas in the highland eastern part they consist of meadow types and alpine thorny bushes.

Mountainous natural grazing lands are characterized by unsatisfactory amelioration. Up to 31% of their area is covered with bushes and thorns.

The area of green grass cover in the region comprises 596,783 hectares, where 72% is made up of remote eastern pastures (Oqtash of Rushan District, Burunkul of Shognan District, Jawshangoz of Roshtqala District and Murghab District).

During the Soviet Union, these pastures were intensively and widely exploited according to the directives of the regime. On these pastures, more than 20 thousand head of big animals and 90 thousand small animals were maintained.

6 The Impact of Climate Change on Livestock-Breeding

Tajikistan with its complex geography is one of the countries most vulnerable to emerging climate changes. For the last 60 years the average annual air temperature in the country has risen by 1 degree Celsius, the number of days with abundant rainfall and the number of recorded drought cases have increased. Based on the evaluation of experts, as a consequence of climate change in Tajikistan there were natural disasters of a hydro-meteorological nature that were accompanied by significant economic losses, which in turn have considerably reduced the country's chances to achieve sustainable development (President of the Republic of Tajikistan 2009). As is commonly known, climate change has rather unfavourable impacts on the environment, agriculture, pastoralism and on other aspects of sustainable development.

Based on the results of the survey conducted between 2006 and 2008, there is evidence of a drought in the region (MSDSP 2009). Due to drought and the inefficient exploitation of pastures, a large number of animals (especially those of the farmers of Roshtqala District) perished. In the course of three years, cultivated lands have been heavily damaged, pastures degraded and many herders were unable to provide their animals with fodder. These things resulted in the number of cattle decreasing considerably. Conversely, in the last two years, the number of days with abundant rainfall precipitation has increased. As a result of heavy snowfalls the winter pastures in the Eastern Pamirs became difficult to access.

Also, the results of some investigations show that between 1956 and 1990, the glaciers of Central Asia were reduced by more than three times and that they continue to dwindle in size, with the average intensity of about 0.1% of the volume of ice. Based on the most modest calculations, the glaciers of Tajikistan, being the main source of the rivers of the Central Asian region, have lost more than the third of their volume in the 20th century (President of the Republic of Tajikistan 2009).

An increase in the air temperature of 2–3 degrees Celsius, according to weather forecasts, will undoubtedly accelerate the process of the melting of the glaciers and result in reduced snow reserves (President of the Republic of Tajikistan 2009). Based on ongoing evaluations, thousands of glaciers may disappear in Tajikistan. The area covered by ice in the country may shrink by 20%, while the volume of ice may be reduced by 25–30%. This, of course, would negatively influence agriculture, including pastoralism, which is dependent upon it. In the early stages, the melting of glaciers would cause an increase of flow in separate rivers – what is being observed at present – which can then be followed by a significant reduction in water in many rivers.

7 Adaptation of Mountain Herders to Change

There are differences in the means of exploitation of pastures and their management between the Western and Eastern Pamirs, which are to be highlighted here. In the eastern part of the Pamirs the herders spend the summer in permanent buildings made of stone and called *el* is a Pamiri terms, which means Kashar in Tajik or Jaylo in Kirgiz, basically the place where herders keep their livestock in the summer pasture during their stay there. The existence of these small summer camping-type dwellings more or less indicate where the pastures are located and can indicate a loss of importance as the people abandon a pasture and its *el*.

The *el* is used as a base for the production and maintenance of milk products to be produced in the course of the summer season. For this reason considerable efforts are spent in the labour process. During summers, women and children often live with the herder in the *el*. In Saghridasht in the western part of the GBAO, in contrast, the herder would spend the summer in a tent without his family. Although this may significantly increase the freedom of movement, it appears to imply that milk products must be processed by the shepherd himself for the whole of the summer. This could perhaps explain why in some cases milking cows are not driven to the summer pastures and instead form herds that remain on the grazing grounds in the vicinity of the village. These animals then inflict considerable damage on the pastures. In the Eastern Pamirs, those who send their animals to the pastures do not always receive the benefit of any milk products for the duration of the season. Most frequently, these milk products help to form a part of the payment of the shepherd.

Also, in the Eastern Pamirs, the local herders (chiefly the Kirgiz) use yurts (*chailoq*). These are convenient dwellings for a nomadic lifestyle, and moveable from one place to another. The other herders of the region should use this method. This method is also appropriate for the herders from western and other parts, whose livelihood depends on livestock development The local herders have the experience of training yaks in order to use them as beasts of burden for transporting loads.

8 Marketing of Livestock Products

The transition of the economy of Tajikistan to a market system required cardinal changes in the structure and contents of the activities of individual as economic units as well as those of the entire economy.

Due to the transformations that took place and the civil war, a rather critical condition reigned in one of the leading sectors of economy, the agro-industrial complex, which is responsible for providing for the food security of the country.

An especially difficult state emerged in the field of livestock-breeding, characterized by a significant reduction in the number of the heads (more than 50%) and the volume of production of animal products. Production transferred from the sphere of public production to the private backyard of the rural population. These circumstances were accompanied by a drastic reduction in real income opportunities for the population, though the consumption of food products remained balanced as consumption of more animal products, in terms of cost, decreased.

During the years of reform, the level of per capita consumption of meat decreased on average by 50%, and that of milk for 30%. Based on statistical data from the Agricultural Department of the GBAO, animal husbandry is developing year after year. On the one hand, cattle-breeding is developing, while on the other hand there is a problem with the market. Private farmers and farming households are not in the position to deliver animal products to the market in a timely manner due to distance. Problems with transportation compels the farmers to sell their products to middlemen for lower prices in the belief that if they do not they will not be able to sell their products at all. A lack of adequate knowledge of the market, as well as the absence of any storage facilities makes it even more difficult for the farmers to sell their animal products.

There is one functioning meat and milk factory in the region. Based on statistics for 2009, the factory produced products worth 114.2 thousand TJS, including

4.2 tons of sausages and 291.2 tons of milk products. Apart from this, small enterprises set up with the assistance of the Mountain Societies Development Support Programme (MSDSP) of the Aga Khan Foundation in Roshtqala and Rushan Districts, function to produce milk products. These workshops process 1,000 tons of milk every 24 hours. (Statistical Committee 2009)

9 Organization and Use of Cultivated Pastures

A large diversity in the types of soils, the landscape of the locations, the moisture of the grass and differences in the economic opportunities require differentiated approaches for how to create crop-based pastures. Dependent upon the ecological conditions and economic opportunities in all categories of livestock-breeding economies of the area, it is possible to apply two main means of creating crop-based pastures.

(i) On the basis of the existing naturally grown grass through a superficial improvement of natural fodder lands (north-western parts of the region).

(ii) Through radical improvement of natural fodder lands, that is, creating sown pastures (south-eastern parts of the region)

In special cases, it may be expedient to create sown pastures on heavily eroded cultivated lands located on the slopes, as well as to allot areas for a special plantation that supports the re-cultivation of plants that composed the previous vegetation cover. This would serve the purpose of preventing erosion of the soil.

In the majority of fodder-growing lands (pastures) of the region (especially in the north-western and southern parts) creating crop-based pastures through planting naturally grown specimens of grass to create superficial improvement is the most effective option, due to the complex landscape and stoniness of the soil. Depending on the conditions, this would include one or several measures: cultural and technical works (collecting stones, removing bushes, etc.), regulating water and air regimes, fighting weeds, planting grass, spreading fertilizers and the profitable use of specific grass varieties.

Sown pastures are created predominantly in low range mountain areas (seldom in middle and high range mountainous areas) on plots with sufficiently potent, adequately watered soils situated on a relatively flat landscape, using weed grass species. Depending on the ecological conditions, this can create economic opportunities for long-term cultivation (5–6 years), short term cultivation (up to 4 years) and one year pastures. The most effective and efficient are the long-term pastures because of the low cost of creating them and the decreased danger of erosion due to frequent planting. Under less favorable soil and climatic conditions, when the grass species do not yield good harvests for a long period of time or are embedded in fodder and harvesting cycles, setting up more productive short-term pastures is justified.

10 Organizing Territory for crop-based Pastures

Based on the agro-technical (geo-botanical) investigation of natural fodder-harvesting lands, relatively flat, stone-less or less stony plots with more fertile soils are selected as areas for crop-based pastures (Table 2).

Table 2: Locating crop-based pastures depending on the ecological conditions and the state of growing grass

Type of soil	Moisture of soil	The state of natural grass	Low mountain land		Mid-mountain land		High mountain land	
			Steepness slope					
			Up to 10 degree	Above 10 degree	Up to 10 degree	Above 10 degree	Up to 10 degree	Above 10 degree
Potent, weak, stone less	Adequate	Good	++	+++	++	+++	++	+++
		Poor	+	++	+	++	++	+++
	Inadequate	Good	++	+++	++	+++	++	+++
		Poor	+	++	++	++	++	+++
Low capacity Average and very stony	Adequate	Good	++	+++	++	+++	++	+++
		Poor	+	++	+	++	+	+++
	Inadequate	Good	++	+++	++	+++	++	+++
		Poor	+	++	+	++	+	+++

The basis for a more efficient utilization of pastures is to transport cattle by truck to the grazing ground. Therefore, demarcation of the transport corridor to the pastures is important for the purpose of reducing the costs, as well as for a more productive use of machinery on crop-based pastures, especially, the irrigated ones. Fencing in the pastures not only appears conducive for efficient exploitation, but also will result in the increase of productivity.

The steepest slopes have to be allocated for crop-based pastures for sheep and goats, while the less steep slopes can be used for the younger breeds of big livestock and common livestock and the flattest slopes and nearby plots can be used for milking cattle (Table 3).

Table 3: Steepness of slope in relation to animal species

	Steepness of the slope		
Species of animals	Up to 15°	15°–20°	20–40°
Big horned cattle	2–3	1.5–2.0	Up to 1.0
Sheep and goats	3.5–4.0	2.5–3.0	1.0–1.5

Source: Data is taken from Land Management Committee Annual Report, 2009

In order to prevent a rapid decrease in the productivity of the animals it is recommended that the following distances for driving milking cattle from the places where they stay during night time be used as a guideline:

- With the sloppiness up to 7 degrees: 2.0–2.5 km
- 7–14 degrees: 1.5–2.0 km
- 14–21 degrees: 1.0–1.5 km

The area under pastures is defined in terms of the productivity and the demand of the number of livestock on green fodder for the whole grazing period, i.e. in the north-western regions this is for 80–180 days. For a period of 24 hours a cow or a hypothetical head of cattle (weight of 210 kg) the required amount of green fodder is 18–20 kg (or 8 fodder units). For a cub of up to one years old, 9–11 kg (or 4 fodder units) is needed and 4 kg (or 1.5 fodder units) are needed for sheep. With a productivity of 114,285 metric centners (4 thousand fodder units) for the grazing period (90–100 days), the approximate allocation per cow is 0.4–0.5 hectares. For young breeds this goes to 0.2–0.25 hectares per head and for sheep it is only 0.05 hectares per head.

According to enclosure 1 (provisions for the herd of cattle in the region of the grazing ground, especially for summer pastures), on average comes to 5.56 hectares per hypothetical head of cattle in the region. However, in some village councils of the region, especially, in Wanj District, the existing pasture area allotted for all types of cattle for summer pasture grazing is insufficient.

The uneven growth of the green cover for uninterrupted feeding of the cattle over the vegetation period must be taken into consideration. The area of pastures needs to be considered in terms of the fertility of the grass in the second half of the summer, or additional feeding of the cattle for this period will be required.

The maximum duration of grazing on pastures must take into account the growth rate of the grass post-grazing and economic indicators in the hopes of having the minimal negative impact. Thus, it has been determined that highly productive pastures can provide fodder for 5–6 days, whereas less productive pastures, where the conditions are very dry, i.e. the eastern pastures of the region, and contamination is low, can provide fodder for a more extended course.

The grazing ground depends on the number of heads of cattle (herds) and the fertility of pastures and the time the animals spend grazing. Depending on particular circumstances, the area of the grazing ground may vary from 5–6 hectares for highly productive fertile pastures for grazing sheep. In major herds of up to 300 cows or herds of more than 1,000 sheep, as well as for the purpose of reducing the cost on fencing, the grazing ground may be extended.

The number of grazers is calculated in terms of the extension of the pasture grazing period, the time on pasture for one grazing period and the number of cycles for grazed grass in a season.

In locations with complex landscapes it is necessary to locate herding crosswise on the identical related landscape (based on the exposition, slope), defined in terms of the fertility of the soil and the botanic composition of the species of grass on the plots that will provide for a more efficient utilization of pastures.

The configuration of herding must be conducive for the convenient grazing of the animals. The best form for herding is considered to be a right angle corner with the proportion of the sides at 1:2 and 1:3. In case of intersection of location as natural constraints for herding serve precipitates, pond, channels. If possible, herds must be located in such a way that each of the herds stays with a single water source.

In the case of unhindered movement of the animals along the herding area, with the extended front section, the width of the herding area must be such that one cow is allocated 1.0–1.25 m, a cub up to 1 year old is allocated 1.0–1.25 m and for each cub less than one year old and each sheep 0.3–0.4 m is allocated. In setting up water supply for the cattle it is necessary to proceed from the following daily requirements of animals: big horned cattle and horses require 40–45 litres, young breeds of big horned animals require 25–30 litres, sheep and goats require 4–5 litres and cubs require 2–3 litres of water per head each day.

Depending on the steepness of the slope in order to avoid the loss in productivity the following measures are recommended on the steepness of the slope in the area.

11 Rational Exploitation of crop-based Pastures

The basis of rational exploitation of crop-based pastures is in the herding method of grazing cattle. Its advantage consists in providing regular, periodic rest for plants and reduces the trampling down of the growing grass. On lands with low productivity or in regions with a sharp, dry climate, such as the eastern pastures of the region, the grass grows too slowly after grazing.

Cattle should not be allowed to graze in one herding location for more than 6 days, preventing repeat grazing and avoiding the danger of digestive illnesses for the animals. The best way to utilize a herding location is for the cattle to stay in one space for 1–2 days and conduct portion grazing, when grazing in an area is carried out for 4–5 hours. Portion grazing can have its maximum effect in tall grasses (above 30 cm) that are long-term or grow once a year.

The grazing of grass should be conducted according to the ripeness of the pasture grass, in other words on its phase of maturity, such as the growth of thorns on the branches and the production of grass seeds. Sown grass with a height of 20–25 cm should be used for big horned cattle; grass with a height of 15–20 cm should be used for sheep. Natural growing grass up to a height of 2–4 cm, or 5–7 cm for tall grass, and sown pastures should be grazed only in the second year of the life of the grass in order to avoid damage to unstable plants, especially, on soft soils. However, these grasses should be cut during their first year.

During the period of intensive growth of meadow-pasture type grass in the spring, the grazing of sheep must begin earlier, with the height of the grass reaching 10–12 cm and grazing should consume 40–50% of the total harvest. The rest of the time, in dry climates (dry steppe), especially in eastern pastures, the degree of exploitation of standing grass must make up 60–70% of the total, whereas in humid areas this should be 80–85%. With this intensity, grazed grasses quickly grow, the periods between the cycles of graze are reduced, and the productivity of long-term grass increases.

In order to avoid the illnesses of cattle such as *titania*, *tempani* during the transition from winter stays to pastures, it is necessary to adapt the animals to young grass, which contain fewer cells but are rich in protein. During the first days, they must not be grazed for the whole day, but only for 2–3 hours a day. At this time the winter fodder feeding should be reduced. It is also appropriate to graze the standing grass, and then drive the cattle to another fresh herding space. The duration of the pasture period along with the measures taken for improving pastures (fertilized irrigation) may be increased through the exploitation of varied grasses within various timelines. This can involve the allocation of several herding spaces with different timings of ripeness of various species of grass.

For a fuller exploitation of standing grass, it is necessary to graze the cattle on southern slopes with dense, dry vegetation for the first half of the day. In the second half of the day, around the watering time, the livestock should graze on the northern slopes of the lowlands with rare forests and late vegetation plants.

Pressure on the pastures is measured by the productivity of land cover including eatable plants, where the requirements for food during the pasture period are calculated out of that. In the conditions of our region, 2–3 cows fall per one hectare of pasture of average productivity and high productivity (fertility 8–12 centners per hectare), where 2–3 cows or 15–20 sheep may be grazed for the duration of one period of pasture.

The density of grazing cattle, or the number of heads of livestock fed on 1 hectare of land, fluctuates greatly and may reach 150–200 big horned cattle, 300–400 heads of young cattle and 800–1,000 heads of sheep without damage to the fertility of land.

The distribution in output of the pastures of the region during the vegetation period is uneven, which is connected to weather conditions (as a rule, shifting with the onset of dry air in mid-summer) and with the biological peculiarities of the growth of long-term plants. Usually, the lion's share of the fodder (50–60%) from the pastures comes at the beginning of the summer, resulting in a surplus of grass in the first and second cycles of grazing, while gradually diminishing and becoming a deficit.

Therefore, during the first half of the summer the surplus grass is used for the preparation of fodder for winter, whereas, in the second half, additional feed for livestock is necessary at the expense of planting one year of fodder crops, concentrate and silage.

In maintaining cattle on crop-based pastures it is essential to observe the schedule for the day: when the cattle feed, the duration of herding, the duration of watering and the length of rest for the animals and milking cows.

An important condition of the rational exploitation of natural pastures is the compatibility of the landscape of the location and the type of standing grass with the consumption habits and needs of the species of animal. Major slopes are indispensable for grazing sheep and goats, while the less steep area is better for the young big horned cattle. Grazing cows are better on flatter plots, as well as on flat slopes with a rich variety of vegetation. Sheep may be allocated more distant high mountain areas and slopes with low-height vegetation.

The nourishing value of the fodder in the natural pastures varies greatly over the seasons. Following the autumn freeze, plants cease to grow and there is a reduction in their nutritious properties. However, despite the low level of their nutritious properties, natural pastures still may serve as a huge source of fodder for cattle, sheep, and horses during low levels of winter precipitation. Of considerable importance for winter feeding are plants that maintain some green leaves. Depending on the botanic composition of the grass grazing, various types of animals require diverse winter pastures.

While using winter pastures, it is necessary to observe the following rules: delineate them in advance and do not use them during the summer, prepare fodder for the winter, equip the stations, locate a watering spot, groom the animals and graze the animals strictly according to the plan. First the animals should graze on plots that will be covered with snow earliest. During the frost and gusty winds, as well as in case of thick layers of snow covering the surface (25 cm for sheep and 60 cm for horses), graze the animals while also feeding them with mineral nourishment (especially salt), fodder and concentrates, if necessary, and water the animals two-three times a day.

An acceptable practice of winter grazing of the cattle, particularly, in the north-western areas of the region, is grazing on sown fodder crops that are frozen as natural frost fodder. This fodder is preserved for the whole winter with virtually all of their nutritious properties intact, except carotene.

In the winter and in the spring, grazing animals on frozen vegetation needs to be combined with grazing on natural pastures. This allows for an increase in the level of utilization of fodder crops collected in autumn up to 95–99%, natural grass for 50–60%, and save 40% concentrates.

Usage of natural grasses every year in the same period would lead to a gradual decrease in the productivity of the pastures and a worsening of the botanical composition of growing grasses. In order to avoid this, it is necessary to change the pastures. In other words, normative grazing with periodical alternation through the years, combined with agro-technical measures aim to raise the productivity of growing grasses.

12 Recommendations

1. The low level of the productivity of pastoral lands is shaping an acute deficit of products of the field and requires a profound investigation of the state of the pasture territories and a search for effective ways of strengthening the fodder base.
2. Naturally, pastures for hay are very different from cultivated pastures in respect of their biological and economic productivity. Hence, the necessity of providing animals with seasonal-pasture fodder is required. Intensive exploitation of remote pastures would lead to the preservation of winter pastures. The priority tasks at present are the rational exploitation of the seasonal pastures and superficial improvements of the hay meadows and the pastures of the region.
3. To conduct research on climate change on the high-altitude zones of the Pamirs.

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4. To identify new and early ripening and frost-resistant kinds of fodder crops through conducting research and establishing demonstration and experimental plots together with research institutes that focus on the high altitude zone of the Pamirs.
5. To observe the rules and regulations of the management of pastoral land assets and prevent the process of degradation of *teresken* pasture lands in the Eastern Pamirs.
6. To design a method of restoration of *teresken* pastures and their incorporation into sustainable process of production.
7. To provide scientifically proven recommendations for the break-up of regions and areas with consideration for their biological peculiarities and climatic conditions.

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4.2 Recent Changes in Pastoral Systems. Case Study on Kyrgyzstan

Ermek Baibagushev[36]

Photo 1: Typical view of mountain pasture in Kyrgyzstan

Abstract

Traditional livestock in mountainous regions of Kyrgyzstan is the main

leading direction of agriculture, its share in gross output structure makes about 40%. During the Soviet Union, the maximum number of sheep in Kyrgyzstan has reached over 11 million heads. According to bioclimatic conditions of the area of the utilised pastures seasonal pastures available covered in summer 3.9 million ha, in spring and autumn 2.7 million ha and in winter 2.3 million ha. Because of a command economy with central planning institutions and an intensification of livestock the condition of pastures reached on average a strong degree of degradation. Along with this centuries-old traditional knowledge and practices to utilise pastures tended to be forgotten. The role of pastures remains to be very important not only in the human-environmental system of Kyrgyzstan, but also for the regional economy. During the initial years after independence and after the implementation of agrarian and land reforms in the country the agricultural sector suffered from an economic crisis and the number of sheep and

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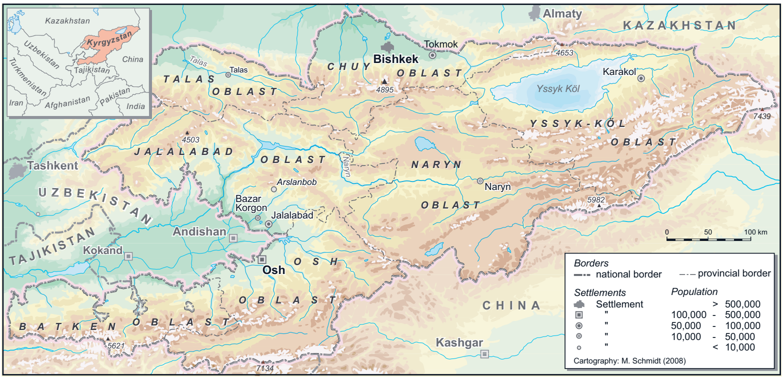
cattle greatly diminished. Consequently, the condition of specific pastures has been significantly improved since. However, in recent years, the number of sheep and cattle slowly increases by the demand for meat consumption in the country and from neighbouring states, i.e. number of sheep has reached more than 4 million, cattle 1.1 million and horses 350 thousands. Along with the conventional use of pastures for animal husbandry multi-functional use of pasture for beekeeping, eco-tourism and collecting medicinal herbs have been introduced. However, today the majority of pastoralists are trying to settle in pastures that are close to water sources and along tracks. Subsequently, these areas experience severe degradation close to the settlements while remote highland pastures are not used and abandoned. To address this challenge the Parliament of the Kyrgyz Republic has passed the Law "On pastures" on December, 18th, 2009. Since then all pastures that are no longer transferred to rental use will be managed by pasture committees and associations of pasture users at local level. A pressing issue at the moment is to define the borders of pastures at the local, district and provincial levels, as well as the determination of tariffs for the use of pasture (through pasture use tickets).

1 Introduction

Since ancient times, the life of the Kyrgyz people has been inseparably linked to agriculture, and especially to livestock. The Kyrgyz have always raised cattle, and grazed them in pastures, while at the same time taking good care of nature and living in harmony with it.

Natural-climatic conditions and the presence of a large area of natural grazing land in Kyrgyzstan, led to the development of animal husbandry, which has become a determining factor in the Kyrgyz economy (Andreeva 1974; Blagoveshensky 1977).

Pastures today are strategic resources for the sustenance and sustainability of Kyrgyzstan (Fig. 1). They represent a great potential for further development of the country.



Source: modified version of Schmidt 2008: 144

Fig. 1: Overview map of Kyrgyzstan

2 Use and Management of Pastures during the Soviet Union

Rangelands are a source of great wealth in Kyrgyzstan. They occupy an area of more than 9 million hectares (Esenkulov 1977, Isakov 1975, Ismailov 1990, Legal basis for pasture management 2010). These alpine and subalpine meadows produced 70% of the agricultural products in the country during Soviet times.

This food was produced naturally in the rangelands of Kyrgyzstan, without any big investment. Only 30% of food consisted of field-feed such as hay, sainfoin, maize and other food and plants. The pastures were the main food reserve, and the productivity of livestock increased because of the pastures, with the country ranking as the third highest producer of livestock in the former Soviet Union (Akynbaev 1988, Andreev 1984, Boyarsky 1988, Ivanov 1975, Starikov & Bublik 1985).

During the existence of collective and state farms pastures were divided into:

Outlying (remote) Pastures: Located far from human settlements, which are used for pasturing livestock only in the summer

Intensive-use Pastures: Located between the Outlying Pastures and used for transhumance and Village Pastures by all species and groups of animals year-round

Village **Pastures**: Located near to the villages, are mainly used for grazing animals year-round.

For seasonal use pastures were divided into three sections: spring and autumn, summer, winter.

Table 1: Distribution of pasture area, pasture productivity and fodder resources

Types of Pasture	Area (thousand ha)	Area (%)	Average Pasture Productivity (centner/ha)	Fodder Resources (thousand tons)
Spring and Autumn Pastures	2,697	30	4.2	1,135
Summer Pastures	3,889	40	5.5	2,141
Winter Pastures	2,285	27	2.7	615
Hayfields	219	3	15.3	334
Total	9,090	100		4,225

Source: data are based on information provided by Kyrgyz Giprozem and Pasture Department of Ministry of Agriculture KGZ, 2010

Pastures experienced an excessive load due to over-grazing. There have been more than 11 million sheep in the country (Ismailov 1990, Legal basis for pasture management 2010, Makarenko & Senchenko 1990, Wilson 1997) when Kyrgyzstan gained independence. This high stocking degree posed a threat to the pastures due to degradation, but science has come to the aid of the pastures. Much has been done to put this process on a scientific basis: the establishment of the Institute of pastures and foraging, the implementation of pasture management at the Ministry of Agriculture and large investments were directed towards infrastructure development. This has led to positive results.

One of the main scientific principles, which were strictly enforced during the existence of kolkhozes and sovkhozes, was a rotational grazing system. This ancient principle allowed for an even distribution of the load on the pastures and was based on transhumance. Therefore, degradation of the pastures was mostly avoided, thanks to state investment and scientific approaches for rangeland management.

Because of the planned economy and the intensification of livestock, the pasture condition changed from mild to severe degradation during the Soviet period. At the same time, the centuries-old traditional knowledge and tools for pasturing have been forgotten (Bacalo & Sheremetievskiy 1982, Starikov & Bublik 1985, Walton 1986).

The economies of the Central Asian Republics of the Soviet Union were highly specialized. The comparative advantages of each region were used in a way which often appears today as not sustainable. Kyrgyzstan was specialized at that time in sheep breeding. Raw materials such as meat or wool were transported to other republics for processing. In return, Kyrgyzstan received consumer goods that were not being produced locally (Andreeva 1974; Legal basis for pasture management 2010).

Centralized organization of sheep shearing and primary processing of wool

The role of pastures is very important not only ecologically and for the economic system of Kyrgyzstan, but also for the regional economy. In the years following independence (1994–2001), the country's agricultural sector experienced an economic crisis, and the number of sheep and cattle was greatly reduced. Due to this decreased livestock, the condition of the pastures has more or less recovered.

The use of mountain pastures

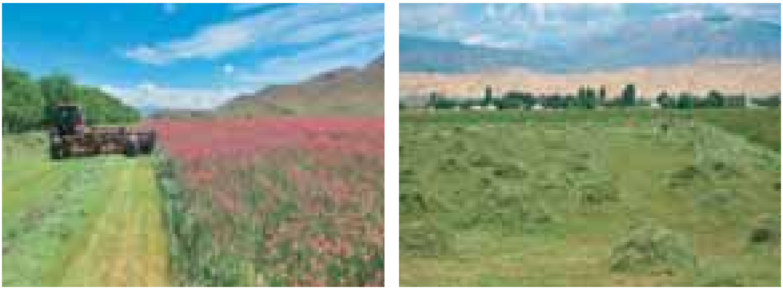
Moving to mountainous pastures

Indeed, in the past two decades, not only has the economic situation changed, but also the use of rangelands (Legal basis for pasture management 2010). Today, mountain and alpine pastures are suffering from the opposite extreme. They suffer from under usage due to the decline in livestock, which has been halved. This has led to an increase in the proportion of dead wood, and as a consequence, to fires. In addition, the composition of grass is deteriorating in terms of quality, as an increasing proportion of the vegetation consists of poisonous plants.

Thus, the mountain pastures today are degrading because of under loading, but Village Pastures have seen their load burden double or triple. The animals are trampling the grass cover. Previously, the development of transhumance created a certain balance. Now the farmers are hardly using alpine pastures because it requires additional costs. In Soviet times, these costs were shouldered by the state and transhumance was strongly stimulated, paving the way for shepherds who went to the highland pastures (Jailoo, summer camps).

3 Current Use and Management of Rangelands

Land reform in Kyrgyzstan began after independence. The first presidential decree allowed for the reorganization of collective and state farms and land leases. This reorganization process stagnated in 1993, with only about one-third of the collective farms reorganized. The second presidential decree in 1994 ordered the distribution of state and collective farms, and the distribution of livestock to individual households. This meant resource management was to be done by farmers at the local level. They were responsible for the production of agricultural products, animal feed and their usage.



Haymaking at the farm level: with machinery and manually

In the context of global climatic change, humanity is facing the challenge of reduced areas of forests, agricultural lands and pastures. Pastures are closely connected with glaciers, water resources and vegetation. All processes in the pastures directly impact on the environment and the climate. Pastures have been, and remain, a source of sustainable agriculture (livestock).

Of the more than 9 million hectares of pastures, 30 percent are Outlying (remote) Pastures, 40 per cent are Village Pastures and 30 per cent are Intensiveuse Pastures. Most of them are located in the Naryn, Issyk-Kul and Chui regions, with fewer in the Batken Region.

The vegetation used as natural grazing lands are characterized by extreme diversity and different yields. Pastures have always been, and remain, a national treasure of the Republic, accounting for 86% of all agricultural land. They are the main fodder for animal husbandry.

Pastures play an important role in sheep breeding, as the food allowance of sheep should consist of 70% or more of naturally grazed food. In addition, the vegetation of the natural grazing lands consists of numerous species of medicinal herbs, honey and ornamental plants. This is the natural habitat and food supply of many wild animals. Therefore, the problems of the pastures are closely related to pharmacology, beekeeping, tourism and the hunting economy of the Republic, as well as the organization of natural parks, reserves and wildlife preserves (Legal basis for pasture management 2010).

Today, land degradation is a global environmental problem and the agricultural land is mainly affected. A characteristic feature of this problem is that the land is constantly impacted by human beings, and often in a negative way. In Kyrgyzstan, a considerable area of agricultural land is subject to degradation in varying degrees.

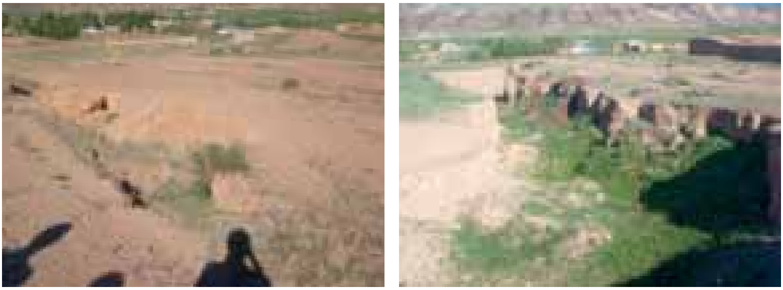
Most pasture users try to stay close to water sources and paths. Subsequently, Village Pastures see severe degradation, while the remote highland pastures are not as used. Unfortunately, today many of the tried and tested pasture skills from centuries ago have been lost.

Many pastures are in poor condition, especially the Village Pastures and those that are most often used by the local people. After the collapse of collective farms, there was a sharp drop in the number of livestock, which has only in-part recovered. Today, agricultural land is being degraded and their structure is destroyed, pastures have become clogged, and this sharply reduces their productivity. People are not taking into account the pasture rotation system, which would give the land time to recover.

In recent years the number of sheep and cattle has gradually increased with the increased demand for meat in the country and from neighbouring states. There are now more than 4 million sheep, 1.1 million cattle and 350,000 horses.

Excessive load on the pastures in the recent past, unsystematic grazing, and a lack of interventions to improve the natural grazing land from year to year leads to a deterioration of pasture grasses. A congested grazing of cattle negatively affects ecological conditions. Significant overgrazing has led to the destruction of pasture plants and degradation of the soil structure, reducing crop yields and, ultimately leading to erosion.

According to the Kyrgyzgiprozem Institute, the average yield of pastures in the Republic decreased by 14% from the 1970s to the 1990s. Much of the area (about 25%) is moderately and heavily degraded (Legal basis for pasture management 2010). Degradation is particularly a problem for spring-autumn pastures. The deterioration of pastures represents a danger not only in terms of reducing stockpiles of pasture forage but also leads to the disappearance of some plant species sensitive to grazing, the loss of unique mountain landscapes, the impoverishment of biodiversity and the destruction of the gene pool. In addition, pasture erosion on mountain slopes contributes to the development of water erosion, which is an irreversible process in the mountains.

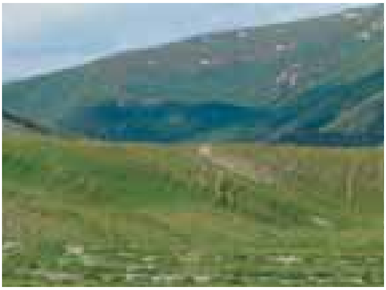


Degradation of village pastures: formation of gully

At the present time, in connection with the liquidation of collective and state farms and the formation of many new small businesses, the system of pasture use has changed. Virtually all livestock business entities are maintained year-round in spring-autumn Village Pastures.

Owners of livestock are not able to utilize the remote outlying pastures due to lack of transportation and funds. The declining number of livestock in the Republic did not solve the environmental problems associated with grazing. The decrease in loads for grazing cattle only affected Outlying (remote) Pastures, where small farmers do not wander. All livestock is contained now in the spring and autumn Village Pastures, which are currently experiencing a load much greater than observed previously.

This imbalanced placement of cattle on pastures leads to further degradation of Village Pastures because of the continued grazing in one location. The soil becomes compacted and there is reduced infiltration of water. If grazing is organized improperly, it reduces the vegetation cover, revealing bare soil and accelerates erosion.


Formation of paths

Effects of water erosion

Landslide processes

Soil salinization

Damage to pastures is caused by the grazing of herds that are too large for a particular pasture site or grazing herds for too long at a particular pasture site without ensuring their rehabilitation. As a result yields and stock grazing forages are reduced. Additionally, non-edible pasture grasses and harmful, poisonous plants are increasing, and shrub-grown pastures are growing as pastures and water erosion increases (the presence of grazing trails, gullies, etc.). For example, the most optimal load per hectare of pasture in the Naryn region is less than one head of sheep per hectare of pasture, and in the Batken region is 3.5 grazing sheep for every hectare.

4 Multifunctional Uses of Pastures today

Along with the use of pastures for livestock development, multi-functional uses of pastures by local people for eco-tourism, beekeeping and gathering of medicinal herbs has developed. Land reform has also led to the formation of economic diversity at the household level. It should be noted that indicators of poverty differ in each region and village.

The strategy of poor households is to invest in their own production: an increase in livestock numbers, purchase and rental of arable land and the purchase of machinery and fertilizers. They may use pasture rotation, rent additional pastures and organize grazing on remote pastures to have access to natural resources.

For the most part, all households are developing animal husbandry and farming, to insure against shocks to the market.

Production of milk products in mountainous pastures

The strategy focuses on helping poor households survive. The production of agricultural products for personal consumption or for barter does not provide additional capital for the expansion of production. Usually, these households specialize in one area of the economy and are entirely dependent on the market. Unable to make ends meet, the land is often rented out to bring in additional income as seasonal earnings. These households are in need of social benefits.

4.1 Present trends in development

Attention should be given to the pastures of Kyrgyzstan, considering this natural resource is a basis for the ecology, economy and production of the country. After the elimination of large state cattle farms, cattle ownership has been shifted to private ownership, with many small cattle holders having developed. The last 4–5 years have seen an increase in the number of cattle, and the number of households that are keeping livestock. The average pasture yield has declined 2–2.5 times. Therefore, the condition of pastures today is a very relevant issue.

Due to economic reasons it has become impossible to maintain the traditionally formed cycle of grazing in different seasonal pastures. Virtually all of the cattle graze year-round near the village. This can lead to large overloads. As a result, this can result in a dramatic reduction in yield, the formation of pasture erosion, degradation, and ultimately it reduces the grazing areas. The main reason for this is because it does not respect the traditional rules and regulations of grazing. The problems include:

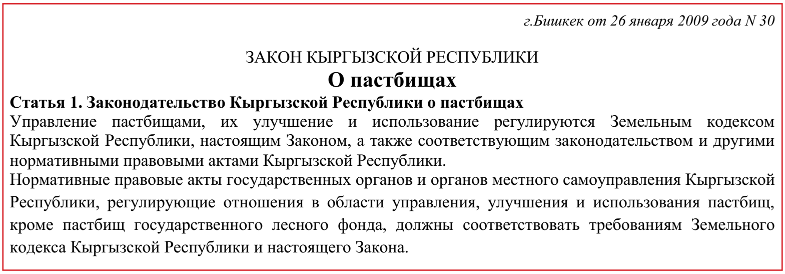
- Excessive load of livestock per unit area at the time of grazing and the daily transfer of livestock to pastures and back
- No compliance with seasonal grazing
- Early spring grazing on mature sprouting grass
- No respect for pasture cycles and exposure to all-year pasturing

These following reasons stem from the socio-economic situation of the villagers:

- Lack of education causes the holders of livestock to be disorganized and conduct unsystematic grazing
- Many farmers are not able to drive the cattle to summer pastures
- The lack of winter fodder reduces the mass winter confinement, hence, early grazing
- The focus on horses and sheep by Kirgiz pastoralists leads to grazing on all pastures during the winter
- Lack of measures to improve community pasture use
- Lack of accountability and control of pastures at the juridical level because the transformation of pasture user rights from the state to the local level is only at the pilot stage

More problems arise in the Village Pastures where there is serious land degradation. The reason for their failure is that in winter the villagers lead the cattle to pastures located around the village. The area of grassland there is small, but the number of cattle is large. To prevent this problem, people must prepare feed for their livestock for the winter.

4.2 The new law on pastures and structures in pasture management



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ЗАКОН КЫРГЫЗСКОЙ РЕСПУБЛИКИ

О пастбищах

Статья 1. Законодательство Кыргызской Республики о пастбищах

Управление пастбищами, их улучшение и использование регулируются Земельным кодексом Кыргызской Республики, настоящим Законом, а также соответствующим законодательством и другими нормативными правовыми актами Кыргызской Республики.

Нормативные правовые акты государственных органов и органов местного самоуправления Кыргызской Республики, регулирующие отношения в области управления, улучшения и использования пастбищ, кроме пастбищ государственного лесного фонда, должны соответствовать требованиям Земельного кодекса Кыргызской Республики и настоящего Закона.

On December 18, 2009, the Parliament of the Kyrgyz Republic adopted the law "On pastures", stating that all pastures not transferred to rental use will be managed by local pasture committees and associations of pasture users.

In order to implement the law "On pastures", which has no analogue in the CIS, Kyrgyzstan began to reform grazing policy by transferring the management of pastures to associations of pasture users. The World Bank has provided assistance to the Kyrgyz Republic in implementing the national policy of pastures through the "Agricultural Investment and Services" project from 2008–2013.

During the time frame of the project, a unified map of the borders of pastures in Kyrgyzstan will be developed, perhaps through the use of aerial photography. Similar work in this country was conducted in the 1990s. During this period, there were significant changes to the understanding the contours of the land, and particularly for the rangelands.

Another novelty of this law is that farmers will be issued so-called pasture tickets, which will be given by the pasture committees. These cards contain information about the number of cattle on a pasture, where they spend various seasons and the routes taken. The mark of the local veterinarian about vaccinations of the livestock must also be recorded on the ticket. The pasture committee makes a note on the ticket giving permission for livestock pasturing and a note about payment for the use of pastures.

A pressing issue at the moment is to define the borders of pastures at the local, district and provincial levels, as well as to determine a tariff for the use of grazing lands (through grazing fees).

According to the law "On pastures", pasture borders should be established on the basis of their distribution within the borders of the former Soviet and collective farms, taking into account the boundaries of existing administrative-territorial units, with no intention to create new units.

Under the old law, pastures could be leased for periods of 5 or 10 years, but this article was deleted under the new law. If the user efficiently uses the land, their former lease remains in force, but they must also obtain a pasture ticket and pay for all livestock.

Under the new law, pasture committees should develop a plan for the use of pastures to control their condition, to keep track of the number of livestock, etc. This plan is very important. Pasture committees must specify the number of cattle, and examine the state of the pastures. Of course, for the pastoral committee this is not an easy job as they have just been created and they lack experience. For the development of the pasture use plans, they should be provided with an example plan. Some organizations are developing methods for assessing the state of pastures, planning their use, etc.

In developing the plan, the pasture committee examines the reasons land was not used. For example, some pastures may not have roads or bridges. In all future work on the improvement of pastures, they will make a plan and determine what work should be done first. They will prepare budgetary estimates for planned work, and, based on the total amount, determine the value of pasture tickets.

There is a pasture management plan. Such a plan has been drawn up for the next five years because roads or bridges cannot be built in one year. This document reflects the work plan to improve the quality of pastures and to budget the cost of their recovery (Legal basis for pasture management 2010).

First of all, pasture committees should teach the people of their district respect for the pastures. If a person does not know about the existence of problems, then they will not be interested in them. In order for the law to function fully, it is necessary to educate people about their usage rights for pastures.

It should be noted that currently there is no organization that studies the state of pastures, and therefore no such studies have been conducted in recent times.

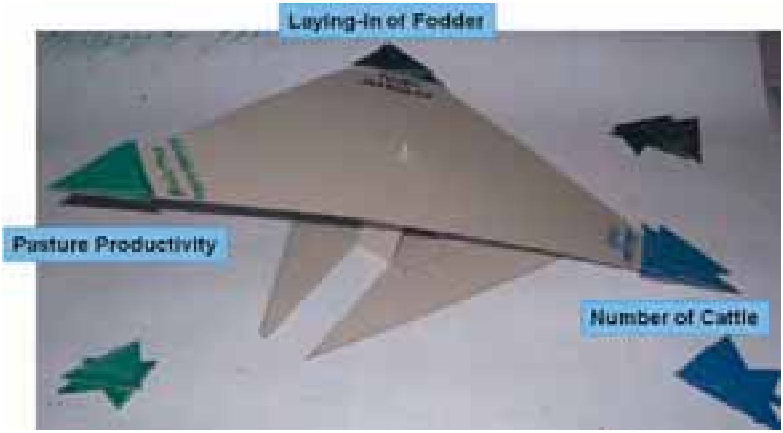
About half of all pastures in Kyrgyzstan are severely affected by different forms of degradation. The loss of pasture fertility, of course, does not mean that they have turned into desert and are not covered with grass anymore. It only means that they grow many inedible and poisonous herbs. If pasture committees develop and implement a plan for the use and management of pastures, they will push for the preservation and improvement of pastures.

Also, one of the challenges facing pasture committees is monitoring the state of pastures. This is a new challenge for these committees. One indicator is the vegetation, i.e., the availability of dock – a sign of pasture degradation, or feather, which is an indicator of a good quality pasture.

Description of grass is the main criteria for evaluation of pasture conditions

5 Recommendations on Pasture Management and Improving Pasture Conditions

To improve the situation in the area of pastures, different pasture taxes, depending on yield, water availability, and the presence of road routes, distance and other factors should first be implemented. A person who uses bad or inaccessible areas should not pay the same tax rate as those who have a good plot.



Balance between pasture productivity, number of cattle and laying-in of fodder

Second, it is necessary to carry out a systematic monitoring of the number of cattle on each pasture, since farmers do not always provide accurate numbers for their livestock. If there are discrepancies, farmers should be penalized. Third, farmers should be trained in the elementary rules of pasture usage, have this knowledge tested and should be allowed to use the pasture only after obtaining a certificate of understanding. Fourth, experts in the universities should be trained on pastures, an information-analytical centre for pastoral resources of the country should be created and a separate and independent institute of pastures and foraging should be recreated. And, finally, technological charts should be developed for the use and improvement of grazing land.

Also, to encourage and facilitate the further development of livestock, the following should be done:

- Creation of new modern mini-shops and mini-processing plants of livestock products
- Creation of a sustainable food supply
- Increase the area of cultivation of forage crops
- Provision of livestock green fodder, by improving the use of pastures
- Use of non-traditional crops of high protein forage such as soybeans, peas, beans, etc.
- Improvement of infrastructure
- improvement of the social conditions of pastoralists in mountainous areas
- The establishment of veterinary service centres in each Aiyl Okmotu (Local Self Governance)
- Opening of shops and warehouses to provide veterinary medicine, equipment and materials, including items for the artificial insemination of farm animals
- Conservation of the sheep genes
- Organization of local centres for marketing and selling of sheep products
- Organizing of wool testing laboratories in the region
- Creation of an Association of Farmers of the mountain regions for pastoralists in order to address economic, financial and legal issues, as well as logistics

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4.3 Pastoralism in China's Xinjiang Kizilsu Kirghiz Autonomous Prefecture

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The Kizilsu Kirghiz Autonomous Prefecture is located on the western border region of China. It covers a vast area of rich resources, especially in the northwest of the Kizilsu Kirghiz Autonomous Prefecture, where the Muztagh and the Kongur mountains are covered by glaciers, which provide a major source of water for the rivers in Southern Xinjiang (here after referred to as Xinjiang). It is of particular importance to the ecological environmental protection and water supply in Xinjiang, especially in South Xinjiang. On the other hand, the Kizilsu Kirghiz Prefecture has a special geographical location, featured by its relatively isolated environment and poor natural and living conditions, resulting in slow economic development and a low standard of living for the local people.

1 An Overview

1.1 Natural conditions

The Kizilsu Kirghiz Autonomous Prefecture is located on the western border of China, with a latitude ranging from 37°41'28 " to 41°49'41" and a longitude ranging from 73°26'05" to 78°59'02". The Kizilsu Kirghiz Autonomous Prefecture borders Kyrgyzstan and Tajikistan in the north and west respectively, with a border line of about 1,190 km. It is connected with the Aksu Prefecture in the east and adjacent to Kashi in the south. Its main topography is mountainous, with mountains accounting for about 92% of the prefecture's total land area. The plain area is rather small and only distributed in the southern Tianshan and in the piedmont of the Pamirs. The lowest altitude of the Kizilsu Kirghiz Autonomous Prefecture is 1,197 m and the highest point is 7,719 m, with the relative height difference between the two over 6,522 m. The prefecture spans an east-west length of 500 km and north-south width of 140 km, with a total land area of 72,468 km^2. In that area, natural pastures have a gross coverage of 3.5 million hectares, or a net area of 3.18 million hectares, accounting for 46.1% and 42.2%

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of the total land area of the prefecture respectively. The cultivated land covers 53 thousand hectares, only 0.73% of the total.[40]

The Kizilsu Kirghiz Autonomous Prefecture is located in the hinterland of the Eurasian continent. It is characterized by an arid temperate continental climate. Due to tremendous varieties in topography, the climate here presents significant vertical differentiation. Its main climate features include adequate sunlight, drought, cold winters, and hot summers, with spring and autumn changeable in temperatures. The climate varies considerably from location to location. In the plain climate zone, that is the sloping plain farming area at the foot of Atushi and Akto, it has rich light and heat resources, a high sunshine ratio, a long frost-free period, distinct seasons, strong winds in spring, dusty weather, scarce rainfall, strong evaporation and an extremely dry climate. The mountain climate zone covers two geo-morphological units, i.e. the western part of Southern Tianshan and the Pamirs' West Kunlun Mountain range.

It is featured by both continental and mountainous climatic characteristics, showing large temperature differences between day and night. Here there are only two distinct seasons, warm and cold, with the warm season short and the cold season long. The annual average temperature from south to north gradually decreases from high to low. The frost free period shortens with increasing latitudes. It averages about 150–170 days in low mountains, and less than 100 days in high mountains. With higher altitudes, there is generally higher precipitation, with great variation from year to year and month to month. The mountainous areas enjoy more precipitation as compared to the plains. The distribution of precipitation decreases geographically from east to west, north to south, and high to low altitudes.

1.2 Socio-economic profile

The Kizilsu Kirghiz Autonomous Prefecture has jurisdiction over one city and three counties – Atushi City, Akto County, Wuqia County and Akqi County – which consists of 37 townships. Among these, there are 26 towns that rely on pastoralism. The prefecture is home to eleven ethnic groups, who are permanent residents, namely the Kirghiz, Uighur, Han, Tajik, Uzbek, Hui, Kazak, Manchu, Tatar, Mongolian and Xibo. In 2008, the Prefecture had a total population of 514,800 people, including a minority population of 475,300. The main ethnic groups are the Uighur and the Kirghiz, and they account for 91% of the total population. The agricultural population is 369,000, of which 26.6% are pastoralists.[41]

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[40] Information on Kizilsu Kirghiz Autonomous Prefecture is based on Hengxin (1998) and Yonggang 2009.

[41] All data provided in this paragraph come from the Statistics Bureau of Xinjiang Uighur Autonomous Region 2009.

In 2008, the GDP of the Kizilsu Kirghiz Autonomous Prefecture reached 2.76 billion Yuan, with the industrial added-value of the first, second and third industries accounting for 23%, 20.5% and 56.5% of the GDP respectively. The farming in the Kizilsu Kirghiz Autonomous Prefecture focuses on grain production. Of the total sowing area of crops, 70% goes to grain and 14.4% to cotton, with 15.6% left for oil, vegetables, fruits and other crops such as clover. Pastoralism consists of two kinds. One is high mountain pastoralism and the other is agro-pastoralism. By the end of 2008, the total number of livestock was 1,591,500, with 32% of the livestock from farming areas and 68% from pastoral areas. The prefecture produced a total output of 31,400 tons of meat; 26,000 tons of milk; 21,000 tons of fruit and 700 tons of eggs. The agricultural output value in 2008 was 1.28 billion Yuan, of which the pastoralism output value reached 460 million Yuan, accounting for 36% of the total. Farmers earned a per capita net income of 1,695 Yuan and herdsmen's per capita income was 1,438 Yuan.[42] Table 1 shows the yield and per capita ownership of animal products of the Kizilsu Kirghiz Autonomous Prefecture and their shares in Xinjiang.

Table 1: Yield and per capita ownership of animal products of Kizilsu Kirghiz Autonomous prefecture and Xinjiang

Products	Yield of Kizilsu Kirghiz Autonomous Prefecture (thousand tons)	Yield of Xinjiang (thousand tons)	Percentage of Kizilsu Kirghiz Autonomous Prefecture yield of Xinjiang yield (%)	Ownership per capita in Kizilsu Kirghiz Autonomous prefecture (kg)	Ownership per capita in Xinjiang (kg)
Meat	31.4	1258	2.4	59.7	60
Milk	26.0	2038	1.3	51.1	97.3
Eggs	0.7	213	0.3	1.4	10.2

Sources: Xinjiang Statistics Yearbook 2009

2 Utilization and Status Quo of Pasture Resources

2.1 Pasture resources

From the perspective of rangeland management and utilization, the landscape elements, topography, vegetation characteristics and use patterns of production, pasture resources in the prefecture can be divided as plain-desert pasture, mountain-basin-desert pasture, mountain-desert pasture, mountain-steppe-desert pasture, mountain-desert-steppe pasture, mountain-pasture prairie, mountain-meadow pasture, alpine-desert pasture, alpine-steppe-desert pasture, alpine-desert-steppe pasture, alpine-grazing pasture, alpine-meadow pasture, lowland-meadow agro-pasture, mountain-basin-lowland-meadow agro-pasture, mountain-valley-lowland-meadow pasture, alpine-valley-lowland-meadow pasture, reclaimed-mountain-valley-cut-grass pasture, reclaimed-alpine-valley-cut-grass agro-pasture, etc. Altogether, there are 18 categories of pasture resources which can be subdivided into 63 types. The total area of natural pastures is 3.50 million hectares, which makes available 2.17 million tons of fresh produce. The theoretical yearly capacity for raising livestock is 1.488 million sheep units.[43]

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[42] All statistics in this paragraph come from the Statistics Bureau of Xinjiang Uighur Autonomous Region 2009

2.2 Utilization patterns

The animal husbandry in the Kizilsu Kirghiz Autonomous Prefecture is characterized by a combination of intensive animal husbandry in the agricultural production area and dispersed pastoralism in the mountain area. Pasture grazing in the Kizilsu Kirghiz Autonomous Prefecture has a long history. The vast majority of seasonal mobile herdsmen have long-term production experience. According to the climate, topography, vegetation and other natural conditions and economic characteristics, local herders have formed a grazing system of seasonal pastures in the region, i.e. winter and spring pastures; winter, spring and summer pastures; summer pastures; summer and fall pastures; fall pastures and year-round pastures. Altogether, there are six different pasture types, of which the first five are mainly distributed in mountainous areas, with a utilization period ranging from 150–210 days, while year-round pastures are located in the plains. This primitive, rational use of pasture resources, which relies on the adaptive and economical utilization methods, is in essence, vulnerable to the influence of natural elements. The equilibrium level of seasonal pastures, quality of pastures, availability of silage and climate conditions have a direct bearing on the development of pastoralism. The annual and seasonal variations in grass output are particularly affected by natural conditions and result in an unstable livestock supply. The traditional nomadic pastoralism that gave birth to the vicious cycle of animals being “strong in summer, fat in autumn, lean in winter, and tired in spring” continues to impact upon and constrain the development of pastoralism in the Kizilsu Kirghiz Autonomous Prefecture.

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[43] Information based on Yonggang 2009.

2.3 Status quo of pastoralism development

Pastoralism is an important part of animal husbandry in the Kizilsu Kirghiz Autonomous Prefecture. It is a long-term, traditional industry that the Kyrgyz and other ethnic minorities rely on for survival and development. With the rapid population growth and people's increased demand for animal products, the prefecture is faced with problems of weak infrastructure, severe degradation of natural pastures and decreasing grass productivity, as they attempt to promote the development of pastoralism. Due to the constraints of traditional production and management methods, the prefecture is still plagued by some prominent issues such as low productivity of pastoralism, low economic returns and lack of opportunities for pastoralists in remote areas to increase their generally low incomes. To promote pastoralism and economic development in pastoral communities, in recent years, the national, regional, and prefectural governments have taken various measures to promote the transformation from traditional to modern pastoralism and to uproot poverty and backwardness in nomadic and pastoralist communities of the remote mountain areas. Positive success has been achieved in a number of aspects.

3 Achievements and Future Challenges for the Development of the Pastoral Sector

3.1 The main achievements of pastoralism development

In a substantial effort by concerned authorities significant changes could be introduced into the pastoral sector that represent a concerted effort in order to transform traditional practices on the way to infrastructure development, poverty alleviation, sedentarization and improved pasture management. Six points summarize the strategies:

- *Deepening the reform in pastoral areas, implementing the pastoral household contract responsibility system and transforming the traditional mode of production and operation*

The pastoral household contract responsibility system is the Communist Party of China's basic policy in pastoral areas. The continuous consolidation and development of the pastoralist household contract responsibility system has greatly mobilized the majority of farmers to protect and develop pastures. At present, the prefecture has contracted out approximately 80.5% of the pastures (Yonggang 2009). Through clarification of responsibility, rights and benefits of users, the production base of pastoralism is effectively protected, while injecting powerful vitality and energy for the further development of the pastoral economy. In this process, pastoralists have also greatly benefited economically, socially and ecologically.

- Relying on project support, and strengthening the infrastructure for pastoralism

Through project support from the national and autonomous regional governments, the three southern prefectures of Xinjiang have made great strides in poverty alleviation and development, ecological migration, consolidating borders and enriching the people and settlements of nomads and pastoralists. Infrastructure building, pastoral settlements and forage bases have all been accelerated. It has strengthened the development base and infrastructure for pastoralism and improved living and working conditions for the pastoralists.

- In 2007 the central government designated Akqi County as a pilot area in poverty alleviation

By the end of 2008, a total of 156 million Yuan was deployed through government bonds for job, wealth and sendentarization programmes (Xinjiang Yearbook 2005–2009). This prioritized the construction of the frontier, rural and pastoral facilities; forage base; disease prevention and major water conservancy project construction. In the short term 55% of the planned programs have been completed, contributing to the development of local livestock production and livelihood improvement of pastoral nomads (Xinjiang Yearbook 2005–2009).

- The steady progress of pastoralist sedentarization

With national and regional government support has encouraged the settlement and semi-settlement of herdsman in the areas of the Kizilsu Kirghiz Autonomous Prefecture with appropriate conditions. Wuqia County has invested 45,400,000 Yuan to build the Mayer Kake Settlements with proper water, electricity, roads, methane-generating pits, fodder pastures, animal sheds, schools, a health clinic and other supporting facilities (Xinjiang Yearbook 2005–2009). In total 323 anti-earthquake housing quarters have been built and 110 houses. In particular 470 individual pastoralists have been settled, with each household having access to radio and television. Through the construction of settlements, the previous problems of lack of information, cultural events, health and education have been alleviated and the nomadic way of life has greatly changed, making it possible for the remote pastoral communities to begin to enjoy the fruits of China's reform and opening-up.

- Betterment of infrastructure for pastoralism

Akto County, in only two years (2006–2007), made an investment of 23.1 million Yuan in water conservancy and other poverty alleviation projects. Through the construction of reservoirs and irrigation channels, 4,200 jobs were created, and the problem of drinking water for 55,000 animals was resolved. 175 km of road, 780 ha of man-made fodder pasture, 360 ha of fenced and improved pastures, and nine breeding stations were completed. Infrastructure improvements helped to consolidate the foundation for the intensive development of modern pastoralism.[44]

- Better protection, management and development of pastures.

To protect and make good use of pasture resources, the prefecture sped up the process of promoting the rule of law in the process of pasture management. On the basis of enforcing the relevant laws and regulations such as the "Pasture Law of the People's Republic", "Measures for Xinjiang Uygur Autonomous Region to implement the Pasture Law" and other national and regional laws and regulations, the prefecture formulated the "Regulations on Managing Pastures in the Kizilsu Kirghiz Autonomous Prefecture ", helping lay a strong legal framework. At the same time, due to the reclamation and fencing of pastures, the protection and conservation of pastures have been strengthened. Many successful models for coordinated economic development and ecological conservation have been created. Models, such as pasture fence, pasture reclamation, pasture reseeding, and pasture improvement with flood water, provide valuable experiences for pasture protection in large-scale. Through the reclamation and settlement programs, pastoralists have been building 14,900 ha of man-made forage base and 13,900 ha of improved pastures, providing support for the consolidation and development of the pastoral production base and enhancement of the ecological and economic functions of pastures (Yonggang 2009).

3.2 Main existing problems

With great support from the central and autonomous governments, pastoralism and economic development in the prefecture has been greatly improved, as has the environment and living conditions of the herdsmen. However, due to poor natural conditions, rapid population and livestock growth and other factors, there are still some key concerns, such as those that follow:

- Serious pasture degradation and reduced productivity

According to a recent survey, the prefecture's degraded pastures account for 94.66% of the total area of pastures, of which there's 45.83×104 ha lightly degraded pastures, about 12.97% of the total; 157.39×10^4 ha moderately degraded pastures, or 44.55% of the total and 131.17×10^4 ha heavy degraded pastures, or 37.13% of the total. Compared with the 1980s, vegetation coverage has decreased by 50% or more, the grass height has decreased by 8–15 cm, the proportion of fine grasses has decreased by 20–40%, the proportion of weeds has increased by an average 20–45%, and grass production has decreased by 30% or above. The degradation of pastures is serious.[45]

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[44] All statistics in this paragraph come from Editorial Committee of Xinjiang Annals 2009.

- Pasture overgrazing

While the problems of pasture degradation and reduced productivity continue to exist, the prefecture's livestock is increasing in numbers, leading to serious overgrazing of the pastures. Over the years, the economic development and improvement of living standards of pastoral nomads relied mainly on increasing their number of livestock. According to statistics, in 1954, the number of livestock at the end of the year was 570,900, but by 2008 it had increased to 1,591,500 (2.79 times that) (Yonggang 2009). Currently about 70% of livestock, prefecture-wide, graze on natural pastures all year-round. In addition, a large number of livestock from the agricultural areas also graze on seasonal pastures, doubling the population of livestock and leading to pasture grazing and the exacerbation of pasture degradation.

- Underdeveloped production modes

The prefecture, like most pastoral areas of Xinjiang, follows a basic mode of production of natural pastures. Extensive grazing without proper management and disorderly utilization are common in pastoral areas. Natural pasture grazing is considered to have the advantages of "minimum input" and "lowest cost of production". Pasture utilization in the past few decades operated under the system of "eating from one big pot". Pastoralism, in fact, was developed at the cost of heavy use of pasture resources. The predatory practice of harming the eco-environment for economic benefits will not only result in lower productivity of pastures, but will also weaken the ecological functions of the pastures. The country has been, therefore, compelled to invest heavily in ecological restoration and reconstruction.

- Insufficient investment in pastoralism and weak infrastructure

The prefecture is economically underdeveloped, with the three counties and one city designated as national poverty counties or cities. The pastoralists are living in poverty. Local fiscal challenges make it difficult to come up with more money for infrastructure construction in pastoralism. Water and road infrastructure is poor. Water scarcity and difficult transportation between grazing points are common. Forage bases in the pastoralist settlement areas are small; not enough to feed all the livestock. Breeding stations, medicinal baths for animals, animal sheds and other facilities are lacking, having a directly negative impact on the popularization of practical technology and livestock production levels. In recent years, despite the prefecture's increased investments year on year, the existing pastoral infrastructure cannot meet the production needs because of its long-term problems of too much utilization and too little input.

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[45] All statistics in this paragraph come from Hengxin 1998.

- Adjusting and optimizing the industrial structure

Traditional concepts and methods of operation combined with the lack of effective scientific and technological support make the structure of livestock production incompatible with livestock development and the requirements of a market economy. The livestock product structure, breed structure and herd structure are irrational, with too many varieties. The process of breeding improvement is slow. The proportion of fine breeds and dams, or females for breeding, are low. The potential of the internal structure of pastoralism has not been fully realized. Meanwhile, pastoralism in the agricultural and pastoral areas suffers uneven development, with unbalanced planting and breeding structures, and a single livestock structure. In addition, the uniform structure of pastoralism production is also one of the main factors restricting the enhancement of capacity and income of farmers and herdsmen.

- The weak foundation of intensification and industrialization and lack of scale

Constrained by geographical location, natural conditions and factors, plus the influence of traditional Kirghiz nomadic lifestyle, pastoralism has been scattered, with the family as the basic unit of management. Family rangelands and pastoral units are the kind of intensive development and scaled operations that are still underdeveloped in pastoral areas. Breed improvement, breeding management, technology promotion, disease prevention and other social service networks are lagging behind. Small-scale livestock production, low levels of organization of farmers and herdsmen, poor information flows and little market promotion of livestock products are widespread, making it difficult to adapt to the market economy or the commercialization and standardization of livestock production. This is not conducive to the development of intensive pastoralism. It also increases the difficulty of income growth for pastoralists and farmers in remote pastoral areas.

4 Development Strategy

The applied development strategy can be summarised in six points:

(i) We shall liberate our minds, change our ideas, strengthen leadership and increase the speed of the development of modern pastoralism responsibly and urgently. We should further emancipate the minds and ideas, and take revolutionary measures to act out of the "administrative and traditional box". We shall take a higher and broader perspective to study and solve the problems of the Kizilsu Kirghiz Autonomous Prefecture. The thinking and understanding of the decisions and arrangements of the governments of the autonomous regions and prefectures should be deepened. Understanding the essential requirements of changing the traditional concepts and tightly grasping the direction of high-quality, efficient development of pastoralism are of great importance. We shall speed up the transformation of traditional to modern pastoralism so that the livestock industry will truly become the pillar industry for rural economic development and income growth for farmers and herdsmen.

(ii) We shall vigorously adjust and optimize the industrial structure, and improve the overall efficiency of pastoralism. We shall adjust the structure of agriculture, forestry and pastoralism; expand the crops of mulching film corn and clover; and develop cultivated crop-based pastoralism. We shall adjust product structure, making sure that the rate of fine breeds among small animals is above 90%, and that of cattle (yak) above 70%. We shall improve the livestock breed structure according to market demand and local conditions. Cattle, sheep, swine and poultry should be raised where conditions are most appropriate. We shall adjust herd structures to reflect the changes in the market and develop a more robust species of livestock, with the ratio of cattle dams rising to 65% and small animals to 75%. We shall improve the breeding methods through administrative, engineering, technology and other comprehensive measures, transforming one-season breeding and extensive grazing into perennial breeding and fattening, and balanced, year-round marketing of fattened stock.

(iii) We shall accelerate and achieve breakthroughs in the development of pastoralism in agriculture. Taking advantage of the strategic agricultural and rural economic restructuring, we shall turn around the farming industry through animal husbandry, promoting the triad crop structure of "grains, cash crops and grasses", and vigorously promoting the combination of agriculture and pastoralism. In the agricultural district we shall accelerate the construction of 2.73×10^4 ha high standard forage base, actively develop multiple and combined cropping and integrated cropping and increase the area for main and supplementary cropping of silage corn. We shall actively develop the forage processing industry, taking advantage of the straw resources in agricultural areas, improving the development and utilization of crop straw, vigorously promoting straw silage, and shortening feeding techniques of long grass and improving the utilization rate of feed resources. We shall develop forage processing enterprises, and promote the research and development (R&D) of concentrated feed and premixed feed, improving the scientific level of feeding and providing cool-season forage to a standardized, large-scale livestock production base.

(iv) We shall promote the development of large-scale production bases and the industrialization of pastoralism. Animal husbandry communities are the starting point to build and develop a new industrial business model based on cooperative organization, shifting from an organization focused on quantity-oriented growth in livestock to one that is based on quality and economic returns. The livestock and poultry production should move towards increased standardization. We shall select the right orientation for the establishment of the leading industries according to local conditions, and do a good job in the near future in promoting the large-scale production of cows, pigs, poultry and specialty products. We shall introduce standardized production, support the leading enterprises, incubate product brands, expand the domestic and international market, actively explore effective mechanisms for linking the corporate and agricultural interests, and bring people to balance the various aspects of farming and pastoralism. We shall gradually establish a market-led development model that relies on main enterprises, production bases, farmers and pastoralists, who are assisted by intermediary organizations that reflect a whole new production and operation model that combines farming and animal husbandry with production, supply, marketing, and domestic and foreign trade.

(v) We shall enhance pasture protection, development and reasonable utilization, and develop a type of pastoralism that is ecologically civilized. Through administrative, engineering, technology and other measures, we shall incorporate the development of pastoralism into the national and regional development program, increase investments and accelerate the pace of construction. We shall tap into local resources to build enclosed pastures, known locally as “grass Coulombs,” that are based on enclosed grass, water, forest, machinery, fodder and other supporting functions. We shall greatly improve grass and animal production and strengthen the management of pasture restoration projects through fencing and other measures, and by improving the degraded pastures. We shall strengthen water conservancy construction in pastoral areas and implement the drilling of wells, diversion of spring water, construction of reservoirs and other engineering measures according to local conditions to expand the area of usable pastures. We shall introduce the practice of letting grass type determine livestock type, and balanced grazing and rotational grazing. We shall make scientific and reasonable arrangements for relocations, grazing livestock breeds and the number and types of livestock. Through engineering measures, we shall encourage the use of remote, alpine pastures and provide development incentives to encourage the whole society to invest in pastures. Through the combination of private and public input, labour force relocation, and other comprehensive measures such as pastoralist settlements, we shall reduce the pastoral population and grazing livestock, and strive to walk a new path of harmonious development of green pastures, strong pastoralism and rich pastoralists.

(vi) We shall insist on implementing the strategy of promoting pastoralism through science and technology. We shall establish and improve the social service system. We shall set up a stable technology team in order to actively introduce talents; strengthen science and technology in order to accelerate product commercialization; enhance training in order to improve the quality of workers and guide the development of farmers and herdsmen though diverse service organizations. We shall strengthen the social service system, enhancing the comprehensive service capability for pastoralism before, during, and after production.

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4.4 Current Status of Pastoral Systems in Gilgit-Baltistan and Chitral, Pakistan

Ghulam Amin Beg[46]

Abstract

This case from Gilgit-Baltistan and Chitral region of Pakistan discusses the context, recent changes and challenges and prospects for pastoralism and rangeland management in the Karakoram, Himalayas and Hindukush. The case argues that while livestock keeping is still a dominant source of household income, due to many internal and external factors pastoral life is giving way to more diversified and non-farm-based activities. However, the recent food price inflation, food insecurity, unpredictable climatic conditions and new opportunities of payment for environmental services has catalyzed interest in rangelands and farm-based livelihoods strategies. The challenge is how to reconcile between customary laws and statutory laws, and how to engage the youth, which comprise over 70% of the demography in farm-based activities and how to develop value chains that attract public, private, civil society and academia in promoting sustainable livelihood strategies for mountain people.

1 Context

1.1 Geographic and socio-economic context

Nestled between the Himalayas, Karakoram and Hindukush, the federally administered Gilgit-Baltistan (GB) region of Pakistan is a disputed territory, between Pakistan and India, bordered with western China and Northern Afghanistan, and only miles away from Tajikistan. Chitral is a district of Khyber-Pakhtunkhwa (KPK) of Pakistan bordered with GB and Afghanistan. With a diverse population of over 1.8 million, the region has a total area of 87,250 km^2, the land-use pattern is dominated by mountains and glaciers (34%), natural forests (less then 4%) and irrigated oases account for less than one percent of the area while rangelands and pastures cover about 52% of Gilgit-Baltistan.

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The Gilgit-Baltistan and Chitral (GBC) region has a colonial past forming the northern most frontiers of the British Empire. Small princely states of Gilgit-Baltistan, like Hunza-Nagar and Chitral state were important posts during the great game and later caught attention during the cold war, when the Soviets entered Afghanistan in aid to the liberal spring revolution, and when much of the West and Pakistan supported the fundamentalist Mujahedeen resistance groups. Due to its strategic borders and passes linking Pakistan with northern Afghanistan, Indian administered Kashmir and western China, the mighty Indus flowing from here and irrigating the plains of Punjab and Sindh, the water resource and energy potentials in terms of highest concentration of glaciers outside the polar region and having unique biodiversity hotspots and cultural heritage, this area has always remained critical for the state of Pakistan, and of interest for researchers and adventurers.

After voluntary accession to Pakistan in 1948, the princely states maintained their local autonomy and the customary laws that governed management of natural resources. With the dismantling of the princely states between 1972–1974, gradually the government of Pakistan came up with new governance systems for the regions ranging from introducing local government systems to this mountain area, to extending statutory laws enforced in other provinces of Pakistan. Many of the environmental and natural resource governance laws including the designation of some rangelands into protected areas, forest and wildlife laws were introduced in 70s, 80s and 90s, sometimes in conflict with local customary laws creating conflicts and difficulties in implementing the laws.

However the accession to Pakistan brought new development opportunities to this region, notably providing communication access by constructing the Karakoram Highway and the Lowari Tunnel and network of roads linking villages and valleys with each other and with main trading centers both within the area and beyond in Pakistan, Afghanistan and China. This was followed by development investments by both government and international agencies that brought gradual improvements in human, financial, economic and physical capital of subsistence farmers and improved the social and development indicators, mainly in the 80s and 90s. A subsistence economy was transformed into cash economy, border trade with China improved, cash crops like potato, fruits and vegetables and other agricultural surplus found ways into the mainstream Pakistani market with an annual sale of 2.5 billion rupees. Tourism, and off-farm business, mainly retailing of food and non-food supplies and services increased, changing the life style and livelihoods strategies of poor farmers who were mostly dependent on livestock keeping and subsistence farming.

Table 1: Land Use Pattern in Gilgit-Baltistan

Land Use	Area (in million hectares)	Percentage
Mountains	2.440	34
Forests	0.313	4
Rangelands	3.760	52
cultivated area	0.054	1
cultivable waste	0.060	1
uncultivated waste	0.618	8
Total	7.245	100

Source: IUCN 2003

1.2 Bio-physical context

The physical environment of GBC is quite harsh, dry and extreme in cold winters and hot in summer. The average temperature fluctuates between -20 to +42 degree Celsius in many locations. Given that less than 2% of the landmass is cultivable, and over 34% of the area is mountains and glaciers, there are resource limitations to exploit the land (Tab. 1). The diverse agricultural and ecological zones also mean that productivity is variable and generally characterized as low in single cropping and transition zones as compared to double cropping zones, which is a small patch of the total available cultivable land (Fig. 1). There is therefore a lot of variability over time and space in the different altitudes, and different seasons of the year.

The precipitation levels are very low getting not higher then 200 millimeter in area below 3000 m above sea level. The monsoon reaches only some parts of the western Himalayas, leaving out the bigger parts of the Karakoram and Hindukush as dry. Agriculture and irrigation channels are designed around gravitational systems. Given the fragility and diversity of the physical environment, the presence of large glaciers, mountains and rivers, the area has potential for all kind of mountain hazards including GLOFs, landslides, avalanches, flash floods and even earthquake. Risks of natural disasters and climatic events are higher and there is high degree of uncertainty and unpredictability.

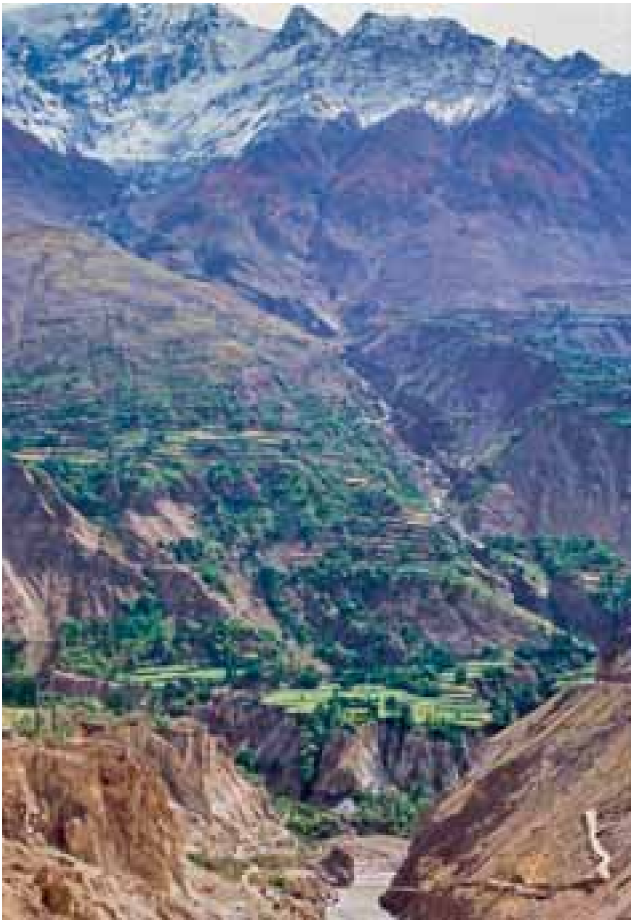

Fig. 1: The terraced villages of Central Nager in the Hunza Valley are the homesteads for shepherds who graze the high-lying natural pastures close to glaciers and the nival zone peaking in Rakaposhi mountain (photograph © Hermann Kreutzmann)

2 Current Status

2.1 Status of pastures and pasturing

In GBC there are several types of pastures including alpine pastures lying above 3000 meters, pastures at the edge of forests, lower area pastures, also known as *shamilat*, close to the irrigated lands, above the irrigation channels. Under the transhumant system, livestock is moved between the alpine and sub-alpine pastures, spending four to five months in alpine pastures and remaining months in lower parts in agricultural production zones.

There are different management practices in different districts of Gilgit-Baltistan, depending on climatic conditions, type of livestock, availability and accessibility to pastures and socio-economic situation.

In general the communities own the pastures. Grazing schedules, rotations and limits are also decided by the communities or groups/clans having ownership of the pastures according to customary laws. Every member of the clan or group has the right to graze in the community/village/clan pastures. Temporary shelters for human and animal sheds are also constructed at the high pastures. Livestock keeping is still a dominant mode of subsistence as 37% of household income is contributed by this sector (AKRSP 2008). Landholding is small (14 kanals[47] of cultivable land per household), the crop season is short (mere 5–6 months) divided into three different agro-ecological zones; single, transitional and double cropping zones. Mixed mountain agriculture is dominant particularly in single cropping zones in the high altitude areas. Livestock is kept for many reasons including source of milk, meat, manure, wool/hair, prestige, movable assets and used as insurance or endowment to be used in rainy days, whether weddings, religious sacrifices, serve special guests or in the case of death of a family member, used for religious offerings.

Other key characteristic features of the pastoral system in GBC include;

- Only part of the households of a village or community (even of the household) move seasonally to the pastures.
- Communities continue to engage in agriculture, and non-farm activities while managing their livestock and attending to pastures.
- Most of the families or communities trade live animals and animal products for cash to buy other food and non-food items from the market and also to fund costs of education and health of their families and children.
- Over the years, the focus in many areas have shifted from goats to sheep and to cows, which require less labour force, are main source of milk and other dairy products, could be fed in the agricultural production zones and forage and concentrate could be made available easily as against keeping goats, which are difficult to manage without surplus human resource and in uncontrolled grazing environments. For example over the years the number of small animals (goat and sheep) has decreased from 16 to 9, and large animal (like cows) has increased from two to four.

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[47] One *kanal* equals approximately 505 square metres or 20 *kanal* match with one hectare.

2.2 Community pastoral practices and perceptions of climate change impact on pastures and livestock keeping

For example in Bagrote valley in Gilgit, talking about community perceptions of the impact of climate change on pastures, communities say they noticed deterioration in the quality and quantity of pastures over the years. They say grass is dry and less green compared to ten years back. They receive less snow and rain and the length of the grass has also reduced from previous 4.5 feet to 1.5 feet (IUCN 2008). They also reported that though people still own livestock and use both high pastures and rangelands around the agricultural production zones, however the overall livestock numbers per household has reduced. Major livestock are cow, ox, donkey, sheep and goats.

It was also reported that natural fodder production in rain and snow-fed areas are a major problem, however the rangelands that are in the agricultural zones which receive water from gravitational irrigation systems, the fodder production is good. Also fodder and concentrate are bought from the market, especially to fed cows and for fattening animal for sale.

In Shigar valley, all households keep livestock which include cow, ox, sheep, goat, *dzo*, and *dzomo*, (a cross-breed of cow and yak). The communities reported that the pastures have deteriorated over the years and some pastures are abandoned for lack of grass. There was noticeable unusual variability in seasons which was impacting crops by 15–20 days (IUCN 2008). Some people reported shrinking size of livestock and attributed it to lesser availability of fodder. However others believed the numbers were constant and that fodder resources are now available in the agricultural zones and also from the market.

In upper Gojal in Hunza, communities reported variability in weather patterns and lesser grazing time on summer and winter pastures as there was lesser grass available, both in size and quantity. Every house keeps livestock, which include yak, sheep, goat, cow, ox and in some cases donkey.

Overall livestock numbers have decreased for many reasons, main reasons given were lack of manpower due to increased focus of children on education, emergence of potato as cash crop, introduction of new breed of cows which are more productive and could be fed locally, changing gender roles, as young women are no more interested in pasturing[48].

It was also reported in the three focussed group discussions in Gojal that as against individual families seasonally migrating to pastures taking all the livestock of the village, now there are three practices:

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[48] Focus Group Discussions(FGD) with 10 mountain farmers by author in Sost June 2010.

(i) *Sur*[49], meaning one person from each household in the village would volunteer to join a group of 3–5 persons, to go to the pasture on rotational basis during the agriculture season (when free grazing is banned in the village) to take care of all the livestock of the village for certain predefined days. The number and days are calculated by the number of days to be spent on one pasture divided by the number of households. No dairy product or any output is accrued for the owners; each group visiting the pastures takes the outputs. If livestock are lost or die, the group is not responsible for it;

(ii) *Qiti*[50], meaning one to three households in the village, who may have either surplus labour or high number of livestock, would volunteer to go to high pastures. Other households in the village collectively pool their livestock and distribute it. The families either provide labour to transport the livestock to the pastures or they pay some amount to enable them to bear the costs. All benefits will go the volunteer family and all losses accrued to the owners;

(iii) *mazdor*[51], meaning the villagers or some households agree to hire the services of some wage labours either from the village or other villages, and pay them to take their livestock to the pastures. Again in this case all benefits would go to the *mazdor*-labours, and all losses to the owners of the livestock.

2.3 Current interventions

In GBC many projects and programmes are focusing on livelihoods improvements, livestock development, rangeland management and biodiversity conservation. These projects aim at improving the conditions of pastures, reducing anthropogenic pressures and promoting sustainable use of natural resources. On the other hand, within the farming and herding 2communities many internal changes are taking place, also triggered by external factors indeed. There are changes in family structures from joint family systems to nuclear families, weakening role of tribal and clan chiefs in deciding organizing labour for farming and pastoral activities due to introduction of new technologies, education, non-farm income sources and awareness about enhanced role of women and changing gender roles. This has in turn impacted the grazing patterns, intensive use of pastures, rotational grazing, deciding on the number and type of animals a family keeps and introduction of new breeds. Anecdotal evidences say in some cases variability in weather conditions is limiting access to high pastures and on the vegetation levels, constraining grazing time from alpine to sub-alpine pastures during the year.

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[49] *Sur* has in Wakhi language the meaning of a person moving the village herds to the high pastures or the guiding of a flock to the pasture.

[50] *Qiti* or *qətí* has the meaning of small group in Wakhi language.

[51] The Wakhi term *mazdor* or *məzdəri* equals the Urdu word *mazduri*: wage labour.

Other dynamic pressures like, demographic transition as evidenced by a youth population, political and economic policies and statutory laws and conservation awareness is also playing role in limiting pastoral use and exploitation of pastures and rangelands at a scale evidenced before.

For example during the last two decades as a result of intensive and extensive agricultural development interventions over 37 million forest and fruit trees, 1,479 private nurseries were established, 953, 637 kilograms of improved crop seeds were supplied to farmers and over 6,808 improved breeds of livestock introduced (AKRSP 2009). This resulted in food and fodder production in the agricultural production zones and also created new income opportunities in the horticulture sector. Preference for keeping newly introduced jersey cows increased over the traditional practice of keeping more goats and sheep due to economies of scale.

Currently, in the dairy and livestock development, the government and other actors are focusing on using livestock as a tool for poverty reduction and ambitiously as an engine of rural and economic growth in Pakistan (DDB presentation 2010).

Box 1: Statement of a pastoralist from Gojal, Upper Hunza Valley:

> *"10 years ago, my family used to have over hundred goats, 54 sheep, only 4 cattle (2 cows, 2 Ox), two donkeys and twenty yaks. We were considered moldor-rich in livestock in the village. We also had 20 kanals of cultivable land in the village, where we used to grow barely, wheat and baqla-black beans. We had a joint family system, a total of 18 people in one house, our parents and their children, our two uncles and their children, our grandfather and grandmother, we all lived together. Women and young children were responsible for taking care of the livestock and for herding on the pastures. There was surplus labour.*
>
> *Today the situation is completely different. We have a nuclear family. All my uncles have separated, even we are two brothers, and one is married and has a separate home and he works for bank and lives in Gilgit city. We have 4 kanals of land, where we grow potato and wheat. My wife is not interested in pastures and keeping sheep and goat. We have only two cows, which is enough work for her, and which gives milk and butter and cheese. We keep 3 yaks mostly in the pastures. Our children are in schools. I am a teacher and we also own 2–3 shops in the bazaar. My father and mother insist we keep some goats and sheep as it would be required for wedding of children or relatives or if they die, we should not go door to door to get one for sacrifice for Chiragh, a ritual of sacrificing goat or sheep. So we are keeping 10–15 sheep/goat to please them".*
>
> *(Bakht Khon, Sost Gojal, 2010)*

Other strategies are accelerated development of and investments in dairy, meat, poultry and allied livestock sectors, identify bottlenecks in the development of livestock, dairy and proposing remedial measures, marketing of livestock and livestock products, producer-owned and controlled organizations and farming groups, capacity development of stakeholders and development and dissemination of technologies.

Major economic activity in Gilgit Baltistan is agriculture and livestock keeping, followed by non-farm activities like trade, government sector employment and tourism. The GB area has a livestock population of 2.4 million (Tab. 2) and Chitral 0.7 million (Tab. 3) including sheep, goat, and cattle. There are three range areas in Gilgit-Balistan; alpine pastures, trans-Himalayan grazing lands and Himalayan forest grazing lands. Similarly there are three major types of livestock production and management system; pastoral, transhumant and sedentary. Recently commercial system was introduced on a small-scale, mainly in semi-urban towns and city areas to supply fresh milk and meat.

Table 2: Regional livestock distribution in Gilgit-Baltistan 2006

S.#	Name of District	Cattle	Yaks	Buffaloes	Sheep	Goats	Camel	Horses	Asses	Poultry	Total
1.	Gilgit	123457	1982	304	168024	311657	00	107	7642	139784	752957
2.	Ghizer	59609	2455	95	47145	76827	17	516	3487	115490	305641
3.	Skardu	121257	7,045	145	168433	244268	0	695	869	137988	691700
4.	Ghanche	47079	3732	14	75138	92921	0	2234	989	46922	269029
5.	Diamer	83449	1100	1705	45415	195148	0	1545	8151	108559	447072
	Total	484851	16319	2263	506155	931821	17	5097	21138	548743	2466399

Source: Livestock and Dairy Development Department Gilgit 2010

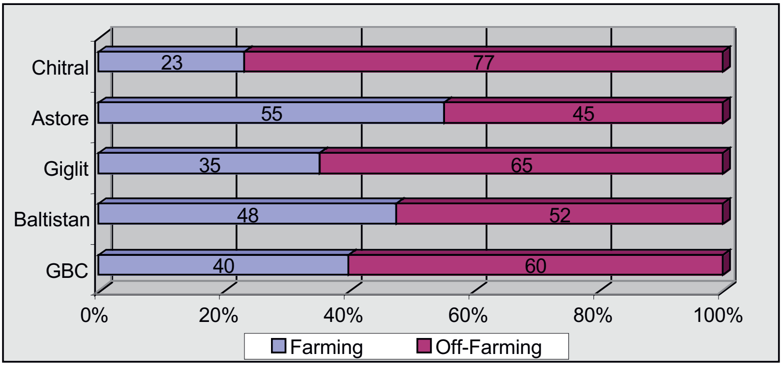
Table 3: Livestock distribution in Chitral

Type of livestock	Livestock numbers		
	1996	2000	2006
Cattle	173262	146547	174842
Buffaloes	279	609	296
Sheep	188822	140617	181146
Goats	335780	242374	347977
Camels	2	317	0
Horses	1194	772	295
Mules	9	587	3256
Assess	5276	4007	63
Total	704624	545830	707875

Source: Livestock and Dairy Development Department Chitral 2010

The illustration (Fig. 2) shows that overall in GBC only 40% of the household activities revolve around farming while 60% are off-farm activities. Except for district Astore (55 farming, 45% off-farm activities), which is in the western Himalayan part and have some of the best rangelands and pastures of Gilgit-Baltistan in other districts the trend is shifting more towards off-farm activities.

Many of the development interventions revolve around areas like land development, irrigation of barren lands, farm forestry, rehabilitation of alpine forests, sustainable farming, water resource management, breed improvements, fodder production, concentrates, animal health/veterinary services, strengthening extension services of line departments, social mobilization, resource governance policies and plans, community participation and local governance.



Source: AKRSP 2008a

Fig. 2: Farming and Off-farm Activities in Gilgit-Baltistan and Chitral

Most of the conservation Interventions include, range management, management of protected forests/areas, watershed management, resource governance policies and plans, parks and protected area management, community conservancy, incentivizing herd size reductions, sustainable use; trophy hunting, organic farming, eco-tourism, Non Timber Forest Products (NTFPs) like medicinal plants and communication and awareness.

3 Current Challenges

Generally, frame conditions such as inherent poverty, population growth, lack of accountability and rule of law, weak participatory governance and failure lack of management capacities to anticipate and plan, ineffective institutions and response agencies, illiteracy and low level of education and awareness are the major factors that create more vulnerability for pastoral communities to use the pastures and rangelands on sustainable basis.

Understanding vulnerability through pressure and release models (Wisner et el,. 2003, Blaikie et al,. 2004) it is clear that disaster events are seen as interplay of hazards and the progression of driving forces that shapes the degree of people's vulnerability to such events. These drivers, which are primarily socio-economic and political, determine the extent to which people could protect themselves and recover from the occurrence of a disaster event. These driving forces act slowly and is generally seen creeping in and tacitly acknowledged, until the sudden onset of a major event, the impact of which is partly determined by the long-term processes which create vulnerability of people and the ecosystems (IUCN 2005).

Pressures of food and social insecurity, migration from rural to urban and semi-urban areas, marginality due to centre-periphery relations, low levels of social attainments and low investments in marketing of local farm-based produces etc., which constitute some of the root causes, evolved over the time and is becoming severe both for sustainability of livelihoods and the sustainable management of pastures and rangelands.

At the management level, issues like micro zoning systems, boundary demarcation between community uses and protected or conservation areas, harmonization between development and conservation goals, authenticity of data and lack of scientific investigations on carrying capacity and monitoring ecological changes and mapping resource capacities etc., are some of the key challenges.

Assessment of the carrying capacity of pastures and rangelands, understanding about the pressure dynamics, availability of water, pasture productivity, fodder production, livestock breeding, marketing of meat and milk products, food supply structure and chains and understanding the root causes, disaster risks and local resilience capacities are some of the challenges to be researched into.

4 Prospects and Opportunities

There are a number of new opportunities and prospects coming up for a revival of interest in sustainable management of pastures and rangelands and its sustainable use in a way that contributes to the well being of the people using these resources. Equally important are the multiple disaster risks including natural, social, political and economic that hit poor families in single and transitional cropping zones more severely, where farmers are engaged in mixed agriculture. Due to uncertainty in marketing their agricultural products, lack of opportunities for employment in off farm activities, lack of employable skills, and increasing populations, some families are reverting back to livestock keeping and pasturing as it brings food, income and also serve as endowment for the poor.

At the academic level, instruments are compensation for environmental services, clean development mechanisms, carbon sequestration etc., are new attractions for the stakeholders be it development and conservation agencies, local organized communities, resource managers, private sector or researchers.

Another important area is increasing interest over the last many years now by conservationists, development practitioners and policy makers and even private sector and local herding communities for cross-border collaboration in biodiversity conservation, nature tourism and agro-biodiversity. This brings a renewed interest in pastures and pastoral systems, re-engaging with new value additions.

There is also emerging interest in multi-disciplinary and multi-inputs projects both development and conservation in response to climate change, food insecurity and price inflation recently. Such projects are conceived as holistic giving considerable weight-age to livestock and pasture management, conservation agriculture as important livelihoods strategies to improve the quality of life of pastoral and farming communities in remote mountain areas mostly dependent on natural resources.

5 Conclusions

Over the years, pastoralism is seen retreating in some areas and reviving in others because of many internal and external factors; diversification of farm (Tab. 4) and non-farm income sources, increased land development for agriculture, more focus on keeping quality breed mainly cows, unavailability of fodder during winters, increase in literacy rates and non availability of surplus labour at household levels, conflicts over pasturelands, conservation policies of designating vital rangelands into state and community protected areas and increased village legislations to control free-grazing in agricultural zones etc.

Table 4: Share of Constituents in Farm Incomes (%)

Constituents	GBC		Baltistan		Gilgit		Astore		Chitral	
	2005	2008	2005	2008	2005	2008	2005	2008	2005	2008
Crops	32	25	31	22	35	31	48	28	23	20
Vegetables	9	11	6	11	16	9	2	8	2	18
Fruits	18	27	17	33	18	25	6	5	24	26
Livestock	41	37	46	34	31	35	44	59	51	36
Total	100	100	100	100	100	100	100	100	100	100

Source: AKRSP 2008a

However, the harsh economic, security and governance crisis in Pakistan in recent years coupled with climate and global changes is severely impacting the livelihood of people in the mountain areas which are in the periphery and generally marginalized lacking political voice and not having fair share in national resource allocations.

Major stakeholders like local communities, development and conservation agencies, private sector and the federal and provincial government in Gilgit-Balistan is now re-orienting the potential of the livestock sector and rangelands as a contributing factor to reducing poverty, sustainable livelihoods and increasing food security through adopting new approaches like farm-based value chain development, animal fattening and dairy development and focusing on fodder production, quality breed, animal health and integrated rangeland management practices. However in terms of overall public sector allocations it is still less then 1% of the total development budget.

Key challenges for pastoral system and rangeland management are, soil degradation, increasing grazing pressure, shortage of cultivated fodder, poor breed and animal health, competition with wildlife and lack of manpower to shepherd livestock in pastures due to demographic transition and supply and demand issues.

Population control, sustainable use, introduction of compensation mechanisms are some of the important actions required. There is also a need to focus on multi-input and multi-disciplinary approach integrating livelihoods, conservation and development goals and involving local communities, local stakeholder's, especially engaging the local civil society and the youth.

Research needs to focus on areas like studying relation between livestock density and rangeland exploitation, climate change and livestock density contributing to low productivity, increase in temperature, and grazing intensity, carrying capacity and impact on livelihoods of the people dependent on pastures and livestock.

Summing up, there is a need to focus on increasing productivity, reducing losses, increasing marketing and value addition and strengthening the institutional, adaptive research and human resource capacities of the government, communities and the local support organizations to take benefit from the new opportunities and the systematically addressing current needs and challenges.

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4.5 New Opportunities for Improving Livelihoods by Marketing Livestock Products from Alay and Pamirs of Kyrgyzstan and Tajikistan: High Value Cashmere from indigenous Goats

Carol Kerven[52]

Abstract

In the last few years, the number of livestock kept in the Pamir and Alay mountain villages of Tajikistan and Kyrgyzstan has been increasing as the national economies stabilized since the end of the Soviet Union and de-collectivisation of state livestock farms. Household surveys have found that currently, poorer villagers, owning the least number of animals, mainly keep goats. Households with few material or social assets (e.g. labour) prefer to raise goats as they reproduce faster and cost less to keep than sheep or yaks.

Recently, these mountain villagers have been able to gain additional income from goats, by harvesting and selling their fibre each year. The local goats produce cashmere, a luxury fibre with a high international value. An active commercial trade has sprung up, initiated by Chinese cashmere processors who send local Kyrgyz and Tajik agents into the villages each spring to buy raw cashmere, which is exported to China. Despite this new business activity, national governments and international projects in Kyrgyzstan and Tajikistan have paid little attention to developing this new income opportunity. By contrast, in the other cashmere-producing countries of China, Mongolia, India, Pakistan and Afghanistan, there has been much support from the state and international agencies to the cashmere commercial sector and to goat-owning pastoralists.

The paper sets out the characteristics of cashmere, some findings from laboratory quality assessments, the marketing chain for the study region, and summarizes the contribution of goats to mountain pastoralists' income. The paper ends by suggesting research, development and policies which could improve the livelihoods of pastoralists in the Alay Pamir, through better production and marketing of cashmere from their goats.

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[52] Odessa Centre Ltd UK, Research and Consultancy on Livestock Systems in Semi-Arid Areas.

Background

Villagers in the high mountains of the Alay Pamir in southern Kyrgyzstan and eastern Tajikistan have long depended on raising livestock (Hangartner 2002). At altitudes above about 3,000 metres, crop agriculture becomes difficult or impossible, due to the short frost-free period in the growing season. Prior to and including the Soviet period, the mountain pastoralists moved their animals seasonally to different pastures, and kept yaks, sheep, horses and goats, which were breeds adapted to the cold winters. De-collectivisation in the 1990s impoverished the villagers, who had to sell many of their newly-privatised livestock to urban meat markets, in order to buy flour and other necessities. Goat populations in Tajikistan and Kyrgyzstan have been rising faster than sheep numbers, since the crash in livestock numbers in the mid 1990s (FAOStats 2010). Goats are economically most important to poorer households. Surveys show that herds owned by households with low incomes contain a higher proportion of goats compared to the other livestock species, than in herds owned by better-off households (AKF 2004, 2005, 2006). As pasture management has been de-collectivised, national agricultural agencies are now concerned that overgrazing by goats is causing land degradation, and are discouraging farmers from keeping goats. There is thus a conflict of interest between households' livelihood goals and national land conservation concerns.

Local indigenous goats (*jaidari* in Kyrgyz and *jodori* in Tajik) of Kyrgyzstan and Tajikistan produce cashmere, a luxury commodity traded globally with a high international market value if sold appropriately (Kerven et al. 2008, 2009, 2010a; McGregor et al. 2009). Cashmere is the seasonally grown and shed undercoat of the goat (*Capra hircus*), produced by domestic as well as wild goats in cold winter climates. The cashmere is a fine warm downy fibre underneath the rough outer protective (guard) hair.

Cashmere has been evaluated from goats in the Pamir and Alay mountains (Kerven 2003, Kerven and Redden 2007, Kerven et al. 2008, 2010a, 2010c; McGregor et al. 2009). The results from Scottish, USA and Australian fibre laboratories show that some of these indigenous goats produce very high quality cashmere, comparable in quality and thus potential market value to cashmere from research-bred cashmere goats in China and Mongolia. High quality cashmere is rare and much sought after by exclusive high-end fashion houses, even during this present world economic slow-down.

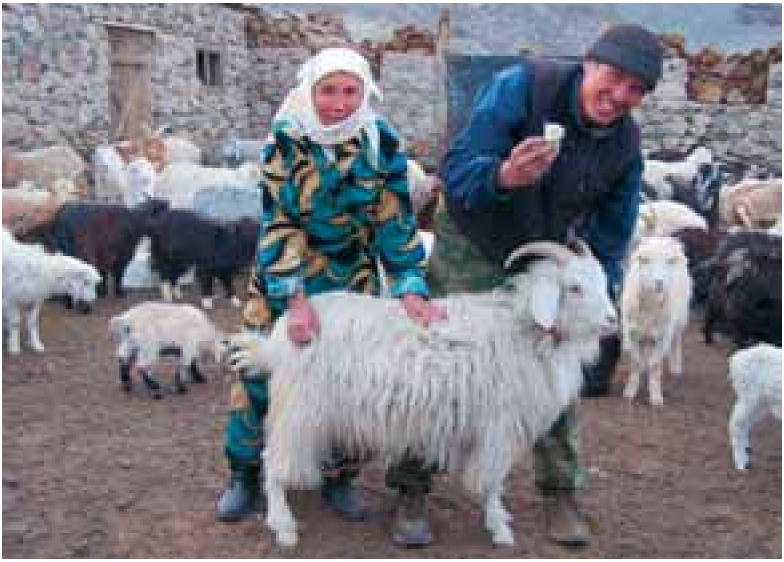

Figure 1: Indigenous cashmere goats in GBAO Pamirs

These local goat breeds[53] are a unique genetic resource in the Central Asian region, one of the genetic origins of goats (Millar 1986). However, these breeds are at high risk of being lost as farmers in the Pamir Alay region are crossbreeding with exotic goat breeds (Angora and Russian Don) previously introduced to state collective farms in the Soviet period. The introduced breeds have a heavier yield of down per animal, which is however coarser and therefore of much lower commercial value in world markets.

Growth of Cashmere Marketing

Cashmere is a new marketable commodity for villagers in the Pamir and Alay. Foreign buyers started about 8 years ago (2002) to purchase raw cashmere from village livestock keepers in mountainous regions of Tajikistan, including the Pamir mountains of Gorno Badakhshan (GBAO) and mountainous regions of southern Kyrgyzstan, including the provinces of Osh, Batken and Naryn. The foreign wholesale buyers come from western China (Xinjiang province), Kyrgyzstan, Uzbekistan and some European countries. The buyers arrange with local agents from villages and towns in Kyrgyzstan and Tajikistan, who collect the raw cashmere directly from mountain households and sell to the foreign buyers. Most of the cashmere originating in southern Kyrgyzstan and GBAO Tajikistan is collected in Osh city in southern Kyrgyzstan and exported directly by truck from Osh to China, mainly across the Torugart pass in Naryn province.

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[53] The term “breed” is used here as “A breed is a cultural rather than a biological or technical entity (Eding 2008). A breed covers groups of animals having similar characteristics that depend on geographical area and origin” (Hoffman 2010 citing Eding 2008).

Cashmere prices received by villagers in the Alay Pamir have generally risen since marketing began 5 to 8 years ago, as competition has grown among buyers keen to purchase cashmere from these new sources in Central Asia (see Figure 2). The prices offered by foreign wholesale buyers fluctuate according to world prices and demand. But in the Alay Pamirs, prices are considerably lower than prices paid for raw (greasy) cashmere to livestock keepers in China, Mongolia and Ladakh (India). For example, in 2009 Tibetan pastoralists in western China sold their combed cashmere for USD 23 per kg, which was however unsorted, mixed colours and from local goats, not special cashmere breeds developed by Chinese researchers. Last year, a Ladakh cashmere processing cooperative paid its pastoralist members differently for two grades of sorted cashmere at USD 27 or 32 per kg. Afghan producers received USD 16 per kg in 2009, again from local cashmere goats. By contrast, villagers in GBAO Tajikistan received USD 4.60 per kg and villagers in Alay region of Kyrgyzstan received up to USD 14 per kg for combed unsorted cashmere in 2009.

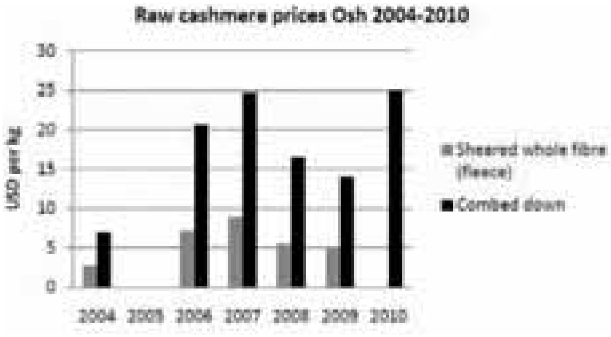


Figure 2: Prices paid for raw cashmere in Osh city, southern Kyrgyzstan, 2004–2010
Source: interviews with traders (Kerven and Toigonbaev 2010a)

There are a number of reasons for the lower prices received by goat keepers in the Alay Pamirs:

- Villagers sell individually to local traders, and do not form marketing associations to negotiate for higher prices
- Villagers do not have the skills to comb and sort the cashmere by quality classes, in order to gain higher prices for better quality classes

- Villagers typically shear the whole fleece from their goats sometimes after some of the cashmere has moulted (fallen off) in springtime and is therefore wasted
- The down from shorn fleeces is sometimes too short for high quality commercial processing, and the fleeces may contain little down if goats are moulting
- Villagers do not receive technical advice on better feeding and breeding of their goats, which is necessary to produce better quality and thus higher value cashmere
- Local cashmere-producing goats have been interbred with imported (exotic) breeds introduced in the Soviet period. The fibre produced by these crossbreeds is of lower commercial quality
- Goat flocks in the Alay Pamir flocks do not produce consistent quality of cashmere, as within each flock some individual animals have good while others have poor fibre, from a commercial point of view. Goat owners therefore sell mixed lots at a flat lower price
- Buyers do not offer any premium price for sorted cashmere but instead offer goat owners a fixed lower price for mixed lots of quality, which buyers then have to sort into classes and add value
- Buyers have high transport costs, due to the poor physical infrastructure, in particular the roads leading in and out from cashmere production zones in the mountains to the destination points in Osh city and further to China

Poorer Mountain Households depend more on Goats

There is potential to develop village marketing of cashmere, which would benefit producers as they would receive higher prices more in line with world markets. Most of the cashmere goat producers in the Pamir and Alay mountains are poor, living in remote mountain villages which have few income-generating opportunities of wage work, crop agriculture or business (Hangartner 2002; . There is statistical evidence from household income surveys that the poorest livestock-keepers in these villages rely disproportionately on raising goats, rather than the other main livestock species of sheep, yaks and cattle.

Interviews by the author with villagers in the Pamir Alay since 2003 have found that nearly all women and men villagers as well as village leaders, traders and development agencies (e.g. the Aga Khan MSDSP) consider that goats have the following advantages for poorer rural families:

- reproduce faster than all the other livestock species – often kidding twice a year and/or producing twins
- are accumulated by poor families as they are cheaper to purchase than sheep, cattle or yaks for poor families to build up their flocks
- require less feed in winter than sheep, as can graze less accessible pastures
- require less herding as they graze by themselves and access steeper pastures, whereas sheep tend to get lost
- can be milked, up to one litre or more a day, for up to eight months a year if kidding twice
- produce cashmere which villagers started selling around 2002

In the mountainous districts of Alay and Chong Alay in southern Kyrgyzstan, mean flock size of goats among households was 7.7 (Kerven and Toigonbaev 2010a). In 2006, in these two districts, 54% of sampled farmers with small stock (sheep and goats) had between 1 and 10 head and 27% had between 11 and 20 head (AKF 2006). Forty percent to 50% of the smallstock in these flocks were goats. A small sample survey of these districts in 2008 found that goat numbers are between three and five times higher than official district counts (Kerven and Toigonbaev 2010a). Local village officials and farmers in this region acknowledge that village goat populations are routinely under-enumerated, as farmers have to pay a higher head tax per goat compared to sheep.

There is a clear trend in these Kyrgyzstan remote districts for poorer households, defined by flock size and annual income, to have a higher proportion of goats than sheep in their flocks (AKF 2006). For households owning between 1 and 10 small stock, 53% of their flocks were composed of goats. 32% of sampled households were in this category of flock size. The proportion of goats in flocks then steadily declined according to wealth rank and number of small stock owned. Household flocks with 11–20 small stock were composed of 39% goats, flocks with 21–50 small stock had 39% goats, flocks with 51–70 smallstock had 28% goats and the largest flocks of 70+ smallstock contained the least proportion of goats at 24%.

In the GBAO Pamirs of Tajikistan, households surveyed in 2008 had a mean of four goats and five sheep. As noted below, as numbers of goats have risen in the last few years, these figures are probably higher now. In Murghab district of GBAO, during the author's field trips in winter 2009 and spring 2010 many village households were found with 15–20 goats and some owners with up to 200 goats (Kerven and Toigonbaev 2010b). Earlier surveys found that among those households owning between 1 and 10 head of small stock, 90% keep goats compared to 52% keeping sheep (AKF 2004). For families owning more than ten smallstock, there was no significant difference between sheep and goat ownership. In the Rasht Valley of the mountainous eastern part of Tajikistan, the general trend is similar, with the poorest village households likely to have goats but no sheep (AKF 2005). Households in the lowest income quartile had a statistically higher likelihood of owning goats. Thus, 88% of households in the group having between one and ten animals had goats whilst 56% have sheep.

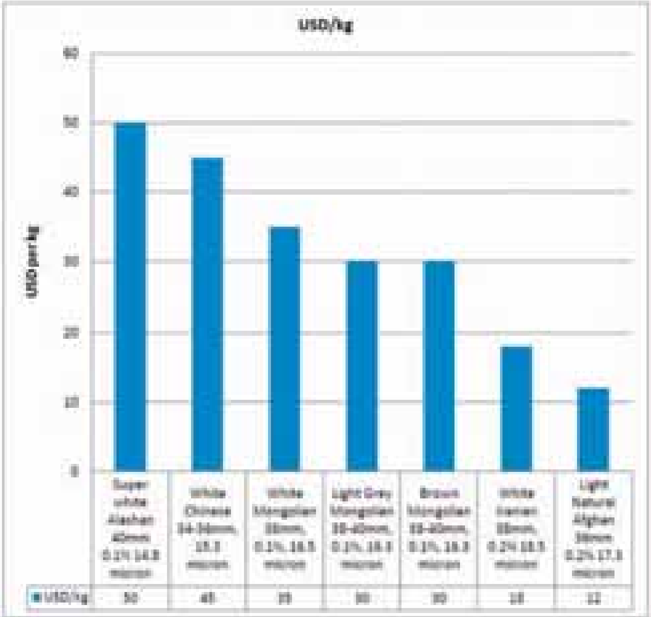
These survey data are validated through informal interviews with villagers, as noted above. Goats are important for supporting poorer village families in the livestock-dependent communities of Alay and Pamirs. Therefore, any feasible means for increasing the utility of goats to families is likely to have a positive impact on family livelihoods. Developing high value cashmere marketing is one of the means to achieve this goal.

Better Prices for better Quality

For the international cashmere industry, prices of cashmere are highly sensitive to quality. This is primarily determined by the diameter, length and the colour of the cashmere fibres. Fibre diameter is measured in microns (µm) which is one thousandth of a millimetre. In addition to fibre diameter, cashmere buyers also have tight specifications for quality based on the diameter distribution of fibres in the fleece, degree of crimp (curliness) and lustre (shininess).

Most cashmere processors, e.g. spinners, weavers and knitters, buy fibre with an upper mean diameter of 18.5 µm (microns) but for high quality consumer products there is a preference for finer fibres with a mean of less than 16.5 µm and particularly those fibres with a mean of less than 15.5 µm. This superior quality has been found in some goat flocks in GBAO and Osh Oblast of Kyrgyzstan, as shown below.

International price differences in diameter fineness, length and colour are shown in Figure 3, below, at the end of 2009. Greasy (raw and unprocessed) Chinese white cashmere of 14.8 micron, length of 40mm sold in the UK for UD 50 per kg, compared to the lowest grade quoted, Afghan light colour, 17.3 micron, 36mm length being sold for USD 12 per kg. Thus there is a price differential of more than 400% between the lowest and highest value cashmere. Put another way, the best cashmere is worth more than four times the worst.



Source: Twist, Bradford, Jan 2010.

Figure 3: Prices for grades of greasy (raw) cashmere purchased in UK, Dec 2009, in USD per kg

Interbreeding Reduces Cashmere Quality and therefore Prices

During the Soviet period, several new breeds of fibre goat were developed by scientists in Kyrgyzstan and Tajikistan. A Russian breed of fibre goat called Pridon, and angora goats originally imported from USA were introduced to a number of state livestock farms in the Soviet period, including Alay region of Kyrgyzstan (McGregor et al. 2009). In Tajikistan, scientists introduced two new goat breeds to state livestock farms including in the Pamirs of GBAO: Soviet Mohair (Angora) and Pamiri crossbred Angora/Predonski/local goat breeds (Karakulov 2002).

These introduced breeds produce more fibre per animal than local cashmere goats, which was the main reason the new breeds were introduced by Soviet scientists. The type of fibre is termed “cashgora”, often referring to the product of crossing cashmere goats with angora goats (Phan and Wortmann 2000).

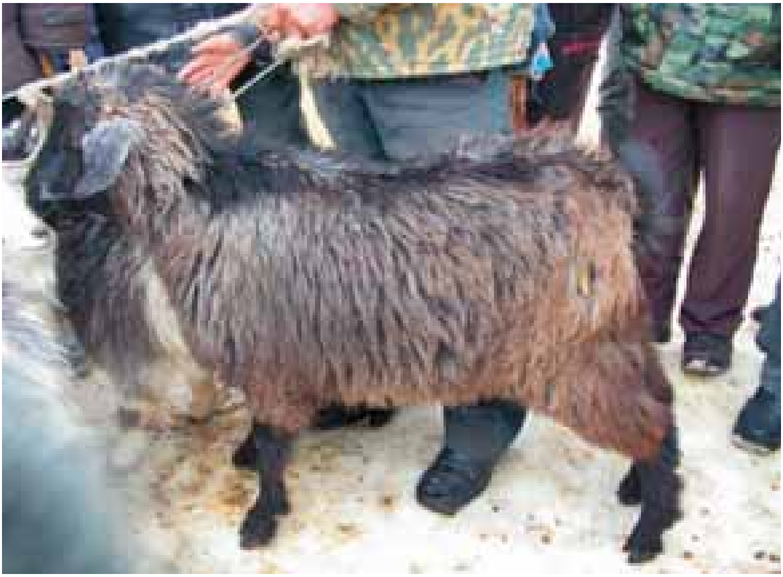


Figure 4: Don-Kyrgyz crossbred goat in Alay; outer guard hair is similar length to down undercoat, and colour is usually dark

Compared to cashmere from local goats, the cashgora produced by the Soviet cross-bred goats has a coarser fibre diameter as well as mohair fibre characteristics of more shininess or lustre and less waviness or crimp, characteristics often unacceptable to cashmere manufacturers, especially those marketing high-class products. Some cashgora can have more intermediate fibres, which makes mechanical processing difficult. World demand for cashgora is limited and cashgora has a much lower price than cashmere on international markets.

Mohair produced by purebred angora goats, is valuable but is not produced any more by crossbred cashgora goats in Tajikistan or Kyrgyzstan. South Africa dominates the world market in mohair; the price for the best quality processed kid mohair in Feb 2010 was USD 45 per kg. This is compared to the best quality processed cashmere from China, quoted at USD 98 per kg (Market Report, Twist 2010).

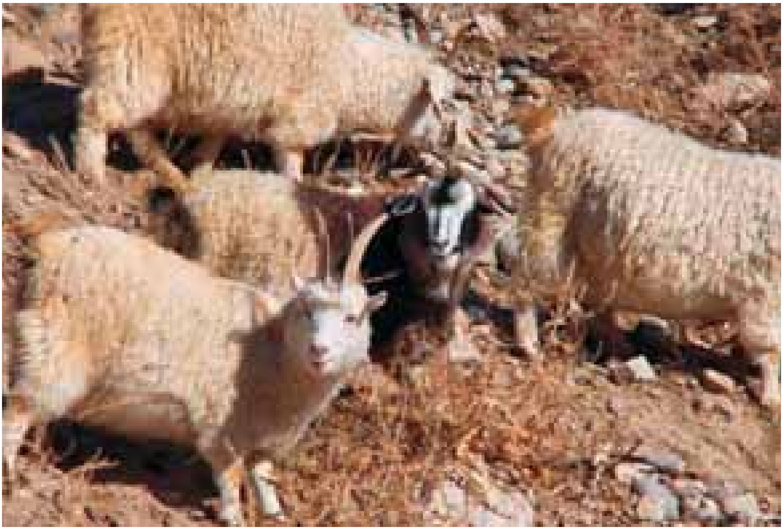


Figure 5: Cashgora type goat in Pamirs, crossbred from local and angora goat breeds. Single coat with long curly fibres, and often white.

What Quality of Cashmere is produced in the Alay Pamirs?

Objective laboratory tests have proved that there are some goats of the best quality found in the Pamirs and Alay mountains. Some goat-owners in this region have these high quality cashmere goats – but they receive the same low prices as those selling the worst quality cashmere. Many goat-owners have mixed or poor quality cashmere goats but no ability to improve the quality of their goats, or even any information on quality variation and the international prices obtained for such differences.

This situation suggests it would be worthwhile for national governments and international agencies to improve cashmere production and marketing, for the benefit of the poorest households in these remote regions.

In southern Kyrgyzstan, an assessment of cashmere samples from over 1,000 goats in 51 villages was carried out for the Aga Khan Foundation MSDSP in 2008 (Kerven et al. 2008). Samples were assessed by a commercial laboratory in USA.

A summary of the main results:

- Some indigenous goats in Alay and Chong Alay districts produce very high-quality cashmere, comparable to the best research-bred goats in China and Mongolia. Some 38% of the samples from Chong Alay district had fibre diameters of less than 15 microns, while 27% of the samples in neighbouring Alay district did so. Only 4–5% of the samples from these two districts were more than 18 microns in diameter, which would not classed as true cashmere.

- Though some fine cashmere was present in the samples from Naryn province in central Kyrgyzstan, in that district interbreeding was very common with the introduced Soviet non-cashmere breeds (Pridon and Angora) which has lowered the fibre quality of many goats there.
- Some goats had ultra-fine fine cashmere of 13 microns in diameter. Such fine fibre is extremely rare and forms an important genetic base for breeding goats with fine cashmere.
- Individual flocks in villages contain mixed ranges of cashmere quality, with some goats' down up to 22 microns in diameter, well above the standard accepted as cashmere. Within individual flocks, there were differences of up to 6.5 microns in the mean fibre diameter of different animals. That would have a major impact on the commercial value of their cashmere.
- Overall, the tests show that some livestock keepers, villages and districts have better cashmere goats than others. But because the goats are variable, the fibre is not uniform, even within a single flock. Mixed lots of variable cashmere are less attractive for commercial buyers who seek the best quality and are willing to pay more for this.

In GBAO Tajikistan, there has recently been a smaller sample survey of cashmere from three districts[54] (Kerven, McGregor and Toigonbaev 2010). This survey is not yet analyzed, but some preliminary results can be given here. A more comprehensive assessment, with a greater number of samples, is needed of the down produced by GBAO goats. In April 2010, a total of 259 goats were sampled from 14 villages in Vanj, Shugnan and Murghab. The cashmere samples have been tested at a laboratory in Australia. In general, these show that goats in Vanj district produce on average much better quality cashmere than those in Shugnan and Murghab. In the Vanj samples (n = 99), the average diameter was 15.6 micron, ranging from 12.9 up to a very few goats with maximum 17.8 micron, and some with adequate length (more than 40 mm).

In Shugnan and Murghab, the average cashmere diameter of the sampled goats (n = 169) is 17.5 micron and up to 21 micron. Thus the average from samples in Shugnan and Murghab is the same as the maximum in Vanj (17.8). The reason for this is very likely to be that during the latter Soviet period, many thousands of angora type goats were brought to some of the state collective farms in Shugnan and Murghab. After the collapse of these farms, these goats were distributed in various ways to villagers and their genes have persisted, through subsequent interbreeding with local Pamiri and Kyrgyz goats. But there are still some good quality cashmere goats in some flocks sampled in Shugnan and Murghab, with 14 to 15 micron cashmere. Angora goats were not widely introduced into Vanj in the Soviet period.

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[54] This is part of a PALM Pamir Alay Sustainable Land Management grant for adaptive research, United Nations University, Bonn and UN Environment Programme.

Some may wonder why these tiny changes in micron diameter are important. The significance is that international buyers are willing to pay much more or less depending on the cashmere fibre diameter – expressed in micron – other factors such as colour and length being equal. A reference back to Figure 3 shows that the international price for very fine (thin) cashmere at 14.8 to 15.3 micron was USD 45–50 per kg, compared to the coarsest (thickest diameter) cashmere at 17.3 to 18.5 micron which was bought at USD 12–18 per kg. There are local goats in the Alay and Pamirs which have super fine cashmere, as low as 12.9 micron and of sufficient length. Many of these local goats are white (an estimated 30% in Chong Alay) which increases the commercial value of their fibre.[55]

Genetic Conservation

Throughout the Soviet period, the intrinsic commodity produced by native goats traditionally kept by pastoralists was discounted, although the hardiness of the native goat was used as a foundation for creating several new breeds to meet state production objectives (Dmitriev and Ernst 1989). Since the passing of the Soviet Union, pastoralists have turned back to their native breeds, and it is fortuitous that these same breeds may provide a basis for developing national cashmere industries.

Nevertheless, since the collapse of state livestock farms in the early 1990s, private livestock owners have been interbreeding the goats introduced to the Soviet state farms with their local goats, as animals are informally exchanged within villages and through markets. The result is that genetic traits of the introduced Soviet breeds have been mixed with local breeds, in many cases.

Recent interviews by the author noted that some villagers have started to introduce angora type goats into their flocks, in villages where these were not present

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55 In 2003, 142 samples of goat down were taken from 6 districts in 2003, where MSDSP was working in the mountainous zones of Rasht valley and GBAO in Tajikistan (Kerven, 2003). These samples were assessed by the Macaulay Institute in Scotland, UK. While all the samples from Rasht valley were fine quality, of the samples from GBAO, only those goats from Vanj district had fine cashmere from 14 to 15.3 micron. Most of the fibre samples from Murghab and Shugnan districts were coarser, being up to 18.1 micron diameter.

in the state farm period. There are also several new internationally-supported projects in GBAO which are bringing in other breeds of goats, which will affect the cashmere quality output. There is a very real risk that the genetic integrity of the indigenous high quality cashmere goats may be ultimately lost, through interbreeding with the exotic breeds.

Villagers in the Pamir and Alay are continuing to interbreed their indigenous goats with the Soviet breeds in part because the crossbred goats produce a higher yield of the marketable down, though of lower quality. Buyers from China and Europe pay producers in these regions by weight of down sold and not by quality grade. Therefore it is in villagers' current economic interest to raise goats that produce a greater weight of down per animal by using Soviet cashgora breeds, which inevitably reduces the cashmere quality. The buyers subsequently have the mixed and low quality down hand-sorted, with the best quality cashmere fetching a much higher price when sold in China or Europe. Because of the interbreeding between local and Soviet goats, buyers are frustrated in seeking pure cashmere which will gain the highest prices when resold. Chinese buyers have discovered a few remote locations in Alay and Pamirs where local cashmere goats persist, and they travel themselves to purchase from villagers, rather than paying local agents as intermediaries.

Goat production, winter feed and natural resource management

As goat populations in Kyrgyzstan and Tajikistan have risen in the past 10–15 years (see Table 2), official concern has grown that goats are particularly damaging to the environment. Goats are blamed by local authorities for causing pasture degradation by overgrazing, though there is a lack of scientific evidence in the Pamir Alay that goats are more environmentally damaging than cattle and sheep, or indeed horses, yaks and camels, also raised in these villages[56].

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[56] A review of publications listed in "Web of Science" from 1990 to 2010 found no controlled studies on the effects of goats grazing compared to other livestock species grazing on Pamir Alay pastures, or indeed anywhere in Central Asian pastures. An internet search on Google Scholar finds many publications on Tajikistan and Kyrgyzstan referring generally to overgrazing by livestock, but little field data and no specific studies on overgrazing caused by goats.

Table 2: Changes in sheep and goat populations in Kyrgyzstan and Tajikistan, 1995–2008

Country	Number of head		% change 1995–2008
Kyrgyzstan			
Sheep	1995	4.9 million	Sheep – 30
	2008	3.4 million	
Goats	1995	0.15 million	Goats + 560
	2009	0.87 million	
Tajikistan			
Sheep	1995	1.9 million	Sheep + 120
	2008	2.4 million	
Goats	1995	0.74 million	Goats + 190
	2008	1.5 million	

Source: FAOStats 2010

This increase is evident at the household level, as MSDSP surveys in 2003 and again in 2009 in GBAO found a 50% increase in the numbers of smallstock kept by households (Robinson 2010). In 2009, official statistics recorded 129,000 goats in GBAO, a 30% increase since 1991, while sheep numbers had decreased by 12% over the same period.

A very recent review assessing pasture resources in GBAO, Tajikistan, concluded that:

"… winter feed production and spring-autumn pasture availability are the biggest constraints to development of the livestock sector. … However very little of the total feed demand or pressure on pastures comes from goats" (Robinson 2010: 4).

Robinson's assessment finds that the existing numbers of cattle and yaks in GBAO would demand 59% of the available dry matter (pasture), sheep 25% and goats only 14% (the remainder 2% demand by equines). There are major climatic and ecological differences between the eastern and western Pamirs, such that in the eastern plateau (Murghab district), goats and other livestock can graze outdoors for almost 12 months in a year, compared to the valley settlements of western Pamirs, where livestock, including goats, must be stall-fed for up to 5 months a year. Many households cannot afford to supply enough winter feed (by cutting or buying hay) to support all their animals over winter, and thus have to slaughter them in autumn. This locks families into a poverty cycle of having small flocks. For those goats which are stall-fed over winter, the level and quality of nutrition is often poor, with the result that as observed by a Kyrgyz cashmere specialist in April 2010 “in Vanj district [GBAO western Pamirs] the cashmere goats are so thin after winter that they fall over if you handle them” (Sabyr Toigonbaev, pers. com.)

Whilst goats are crucial to livelihoods of pastoralists in the Pamir Alay, especially to poorer households, some agricultural professionals blame goats for environmental destruction, particularly of larger woody species unpalatable to sheep. However, as Robinson (2010) and Central Asian researchers (Alimaev et al. 2008) have pointed out, goats, like all livestock, are most likely to damage pasture where relatively high numbers are kept with restricted mobility. Livestock mobility allows grazing pressure to track available resources at different seasons and is thus key to good pasture management in environments such as Central Asia which are temporally and spatially variable (Coughenour 2008). In the Pamir Alay, the obstacle to seasonal movement is economic; costs of transport, shepherding fees and pasture tax. At remote seasonal pastures, water points and shelters have also fallen into disrepair. Other barriers to mobility are new land tenure regulations, as use of remote pastures must now be negotiated with various actors whilst some pastures may be annexed by larger herd owners for their exclusive use (Robinson and Whitton 2010).

It is the concentration of animals around settlements and the difficulty of seasonal movement, rather than animal numbers themselves, which is likely to cause environmental problems (Hoeck et al. 2005). A critical shortage of winter feed in the Alay mountains of Kyrgyzstan and the Pamirs of Tajikistan combined with the small area and fragility of winter pastures around settlements means that these pastures are so particularly vulnerable to overgrazing by all the livestock species kept, including goats.

Opportunities for Research, Economic Development, Environmental Protection and Policy

Research

1. Conservation of biodiversity and genetic resources must be a long-term objective, based on reliable and up-to-date scientific data. A time-dependent priority is that the indigenous goat populations which remain in isolated remote pockets of the Pamir Alay need to be characterised and conserved. The indigenous goats of Central Asia and the Pamir Alay in particular, have not been characterised since the 1970s (Dmitriev and Ernst 1989), and not by modern standards, including genetic characterization. It is now known that these indigenous goat breeds produce fibre (cashmere)

of considerable economic value on world markets, but are at risk of being lost through interbreeding with introduced breeds (McGregor et al. 2009). Once the location and quality of cashmere goats is verified, this information can be made available to buyers who wish to purchase superior quality and are willing to pay premium prices for graded and good quality cashmere.

2. China leads the world in basic and applied research on cashmere goat breeding. In the last twenty years, out of some 400 articles on cashmere goats in international scientific journals cited in Web of Knowledge, Chinese researchers have published more than 120 articles. This research foundation has resulted in China having the world's most consistent and best cashmere goat breeds, as acknowledged by the global cashmere industry.

There are also concentrations of cashmere researchers in Europe (especially Spain), Australia, and UK. The experience of Chinese and other international scientists on cashmere breeding research is an asset for initiating cooperative research on cashmere goats in Tajikistan and Kyrgyzstan. The main aim of such research would be to identify the best indigenous cashmere goats and selectively breed these to meet the criteria for international standards, viz. fine fibre diameter, good separation of down (undercoat of cashmere) to guard hair (coarse outer coat), length of fibre, colour (white and light preferred), crimp (curliness) and not shiny. Livestock-keepers' priorities would also be a basis for selection, namely, higher proportion of down in the coat (more cashmere yield per animal), bigger size (for meat production) and higher milk yield.

Economic development

3. Training and encouraging producers to comb the cashmere from their goats would increase the monetary value of the product sold. Very few goat owners in the Pamirs and Alay comb their goats as most people in these regions shear their goats in late spring and sell the whole fleeces to traders. Shearing goats is economically inefficient. Indigenous goats of the Pamirs and Alay often produce quite short cashmere, and the length is further shortened by cutting rather than combing. Buyers who seek the best quality find the cut cashmere from indigenous goats is sometimes too short for satisfactory processing. This reduces the commercial value still further.

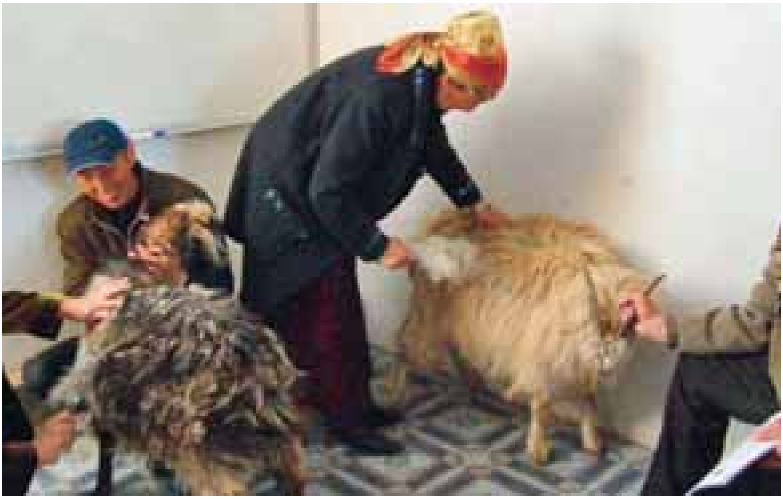

Figure 6: GBAO villagers learning how to comb goats at farmer training workshop, 2010

4. Development of cashmere marketing in the Alay and Pamir regions must be based on sound information about the quality and quantity available. Marketing is demand-driven and the commodities have to meet the requirements of the cashmere processors and eventually, the consumers. At present, new potential investors cannot contact a central point to obtain information about cashmere goats and production in these countries. A service to cashmere marketing would be to set up an accessible internet data base on the numbers, locations and quality of cashmere goats in Tajikistan and Kyrgyzstan.
5. A cashmere market data base could also be seasonally updated with changing price information by location. Since there is ample international demand for cashmere from both Tajikistan and Kyrgyzstan, and the commercial marketing chains already connect the Pamir and Alay regions, there is no reason for the two countries to compete for market share of cashmere sales.

International market information on prices each year for types of cashmere would be very useful for village-based traders and livestock producers to plan their sales strategies. Commercial buyers at both local and international levels are in competition and are therefore naturally reluctant to reveal the farmgate prices they offer to producers as well as the wholesale prices they receive from processors in China and Europe. Nevertheless, in Mongolia seasonal price information on grades of cashmere transacted in different rural and urban locations has been collected by projects for a number of years. In the cashmere-buying season, this price information is disseminated weekly through radio, TV, internet, SMS via mobile phones and bulletins posted at rural administrative offices. Producers and small-scale traders can thus choose where and when to buy and sell, based on frequently updated price seasonal information. Producers can also appreciate the price increments offered for better quality cashmere, which provides an incentive for producers to upgrade the quality of their goats, and to sort by grades.

6. There is currently no processing of cashmere in GBAO or southern Kyrgyzstan. Added value is thus lost, as the raw cashmere is exported to China. Investment into a large cashmere processing plant in either of these countries is technically challenging and expensive, and would not be economically justified at this point. Some small and relatively inexpensive cashmere dehairing machines are available from China (average equipment cost of USD 10,000). Developing a "Made in the Alay Pamirs" niche line of dehaired processed cashmere which met organic and ethical trade standards, would be a good start. European and USA cashmere buyers are constantly seeking new and alternative sources of cashmere, as China and Mongolia produce most of the world's scarce supplies of cashmere. Some of these buyers may be willing to invest in small niche production lines of cashmere from the Pamirs.

Environmental protection

7. A realistic approach to conservation assumes that land users make pragmatic decisions, and that land degradation and poverty are causally linked. Poor households have difficulty buying high quality winter feed and moving their animals to graze at the better summer pastures. Nevertheless, pastoralists in these regions have a long tradition of seasonal livestock movement, and are quite aware that this form of grazing management is optimal both for animal nutrition and protection of pasture resources (Hangartner 2002; Domeisen 2002). If livestock owners can gain higher income from more efficient marketing of their animal products, cashmere in this case, they will have greater incentives and financial ability to invest in better animal management. This would lead to reduction of grazing pressure around settlements through livestock seasonal mobility and better livestock nutrition.

8. In other cashmere-producing countries (e.g. Mongolia), commercial, donor and government programmes have successfully linked improved goat nutrition with community cashmere marketing schemes, by supplying community groups with fodder for goats in winter, in return for the group's guaranteed supply of raw cashmere to specified standards. This is a form of short-term tied credit. These programmes would reduce the risk of over-

grazing by goats around settlements, since additional fodder resources are supplied. Improved winter nutrition would enable higher numbers of goats to be supported and thus increased cashmere production.

Policy

9. The Chinese cashmere production and processing industries have benefitted from several decades of strong and direct government support. As a result, China's cashmere industry is thriving, causing long-established European and USA cashmere companies to become uncompetitive. Being linked into an organised cashmere industry, pastoralists in the most remote rangelands of China have been able to regularly gain their main source of cash income from the annual sales of cashmere from their goats.

In striking contrast to the level of Chinese government assistance to their cashmere research and industry, there is no evidence that the governments of Tajikistan or Kyrgyzstan are concerned to promote cashmere research, production and marketing in their countries. There is an opportunity to improve livelihoods for some of the poorest and most remote rural households, whose livestock strategies are often focused on raising goats. There are also opportunities to create local employment and value added through first-level processing techniques such as sorting, bulking and washing cashmere prior to export.

10. Joint country policies would assist in promoting the cashmere trade from GBAO Tajikistan to Osh in southern Kyrgyzstan. This is a well-developed trading route not only for cashmere but for live animals, foodstuffs and other commodities. At present, the trade is hampered by numerous export regulations and customs duties for cashmere from Tajikistan. These need to be clarified and reviewed. At present, the Government of Tajikistan appears to seek protection for national livestock processing industries, by charging high duties on the export of cashmere and prohibiting the export of certain categories of cashmere. However, there is not at present any cashmere processing industry in Tajikistan to protect.

Strengths	Weaknesses
✓ Fine diameter cashmere from indigenous goats ✓ Good experience in goat husbandry ✓ Suitable mountain pastures for goats ✓ Relatively low labour costs ✓ New income source for villagers ✓ Demand from Chinese firms already exists ✓ High value and light weight product ✓ Low transport costs to Kyrgyzstan and China cashmere markets ✓ Strong support from international donors (ACTED, GTZ, MSDSP, FAO)	✗ Low integration in the national value chain ✗ Low production capacity ✗ Absence of market information ✗ Very poor marketing ✗ Very poor roads and electricity supply ✗ No professional breeding scheme ✗ No reliable vaccination scheme ✗ Pasture area is not always accessible ✗ Different breeds of goats on the same pasture, interbreeding ✗ Not enough combing equipment and experience of combing ✗ Not enough skilled combers available ✗ Farmers prefer to shear instead of combing ✗ No cashmere sorting system ✗ No standardized bale packing system ✗ No reliable testing facilities to evaluate cashmere fibre available ✗ No national cashmere trader infrastructure (collection, grading) ✗ No national early stage cashmere processing facilities (scouring, dehairing, packing) ✗ Low cashmere price for producers because of no international awareness ✗ Limited number of cashmere buyers visit the country

Opportunities	Threats
✓ Long standing tradition and experience in goat husbandry ✓ Conserve unique genetic characteristics of high quality Tajik cashmere goats ✓ Higher prices for Tajik cashmere if international awareness can be achieved ✓ Raised production and improved quality through higher prices ✓ Recognition of Tajik cashmere at the international level; branding ✓ Investment in early stage processing in Create employment ✓ Train producers on cashmere combing and sorting, supported by international donors	✗ Farmers prefer to shear goats instead of combing ✗ Chinese dominance after some years (because of direct road connection with China) ✗ Decline in demand for cashmere ✗ Remains of angora goat influence from the past ✗ Geographical isolation from other markets ✗ No financial support from government ✗ Overgrazing by goats ✗ Unreliable energy supply

Source: S. Toigonbaev in Kerven and Toigonbaev 2010b.

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››› 5 Field Trips in the Western and Eastern Pamirs

Traverse from Gorno-Badakhshan to Xinjiang via Kulma Pass

5.1 Reducing Pressure on Rangelands through Alternative Energy, Water Management and joint Forestry Management

Summary of field trip – Roshtkala Valley

The project is based in Khorog and financed by the German Ministry for Economic Cooperation and realized by the German development agencies GTZ and DED. The main goal of the project is to contribute to an improvement of the livelihoods of the local population in the Pamirs while reducing the degradation of natural resources. Joint Forestry Management, Energy Efficiency and Water Management are the main component of the project.

Joint forestry management in Roshtkala District

The Soviet legacy in the Pamirs involves a dependence on external inputs. With the collapse of the Soviet Union, the people of the Pamirs were forced to find alternative fuel sources. Illegal collection of firewood is a common practice among the rural population to meet basic needs for heating and cooking. In addition, uncontrolled grazing of livestock hinders a natural rehabilitation of the forests.

Joint Forestry Management (JFM) means that private tenants are given long-term land use rights for a forest plot of a few hectares, providing an incentive for sustainable natural resource management. Detailed contracts between the forestry authorities and private tenants are developed jointly with management plans to ensure sustainable management of the plots in the pilot area visited in Roshtkala district.

The forestry agency, *Leskhoz*, rents the forest under its supervision to the local population for a lease period of up to twenty years, with the possibility of extension. This is done in order to combat the degradation of the forests, which has been accelerated after the breakdown of the Soviet Union, due to the abrupt stop of the subsidized fuel from the central government. Without alternatives, people began to cut down forests for fire and construction wood. The Tajik forestry agency has neither the money nor the staff to manage illegal and uncoordinated deforestation. The idea behind JFM is to create ownership of the forests in order to protect them through use. Forest tenants can keep 30 per cent of the forest products, and 70 per cent is given to *Leskhoz*. After some years, the tenants and the forestry agency will profit significantly from the rehabilitation of the forests. Along with the user rights for the forests, the tenants have to fulfill certain responsibilities in order to rehabilitate the forests. Therefore the forestry agency elaborates individual management plans for every plot together with the tenants, which includes work to be done, such as fencing, afforestation and the digging of canals as well as the amount of products to be harvested. Further steps of the project include setting up an association of tenants in order to enable larger investments and organize the selling of their products jointly and the up-scaling of the lessons learnt in the project into a reform of national forestry codex of Tajikistan.

Energy efficiency

In a harsh arid, steppe mountain climate such as the Pamirs, daily survival can be a struggle. With winter temperatures dropping down between -30 and -60 degrees Celsius, fuel for heating is an essential component of Pamiri livelihoods. *Teresken*, wood, dung, and coal are the primary fuel sources.

Fuel-efficient stoves are one way to decrease the amount of fuel consumed. Scarce availability of fuel is certainly a primary limiting factor to the improved livelihoods of the rural Pamiri population. Locally developed and produced alternative technology can alleviate pressure on the natural environment. Local craftsmen are trained in producing high-quality doors and windows. In 2009, approximately 100 houses were insulated. The products are then disseminated via micro-credits. Other products include efficient stoves for heating and cooking, heat-exchangers and solar water heaters.

The group was able to view many of these technologies first-hand at a model house. Various styles of thermal insulation were displayed, three types of stoves, and a solar hot water heater. The project disseminates these products to the community through a representative from each village who owns a catalogue which displays all of the products. Clients can then choose the product which they are interested in and either place an order or visit the workshop in Khorog or Roshtkala centre. Clients can then access the services of the local microloan organization *Medina*, where they receive loans for up to one year, paying 2.5 per cent interest on the rest sum.

The group visited a model house, which was retrofitted with energy efficient floors, ceilings, windows, door and *roetz*. The total energy savings of such a house are estimated to be approximately 37 per cent, factoring in the environmental savings. The total retail cost of these modifications is USD $700. In a survey of 42 households, GTZ found that the majority of people felt a temperature difference and that were spending the money they saved through thermal insulation either on paying back their credit or on their children's development.

Water management

A product of the complex history of dynamic management regimes in ex-Soviet states, has led to the current inefficient use of Central Asia's most abundant resource-water. The GTZ/DED project is striving to elaborate, test and later to disseminate suitable pumps, water storage systems and institutional approaches which will improve land use and contribute to the regions' adaptation to climate change.

The project focuses on three pillars of water efficient technologies: pump technology, water harvesting and the enhancements of traditional irrigation technologies. Swim pump, hand pump, treadle pump and rainwater harvesting are the major technologies promoted by GTZ.

The specific projects visited were two RAM pumps in one location, which pumped water up 70m uphill to two separate storage units. A gradient of two vertical metres is needed for adequate pressure to pump the water upwards.

The retail cost of the 10 cm/diameter pump is USD 150.

The water is pumped up to a 12m^3 reservoir, which stores water for irrigation of agricultural crops. The owner paid for the pumps himself, through a micro-loan organization. After a two-month trial period, the client can choose a repayment scheme of 3, 6, 12 or 18 months. GTZ has estimated a two-year return rate based on a calculation of 500m^2 of land.

Photo 1: Water management demonstrated to the interested participants by GTZ staff in Roshtkala Valley

Observations of group members

A filter is used in the reservoir to keep out major debris, and members from Pakistan were concerned with the maintenance of the pump in conditions where the water is laden with sediment. Members from Pakistan were concerned of social conflict as a consequence of one farmer receiving the pump which irrigates only his own land; however, since the farmer purchased his own pumps and is irrigating his own land, there is no basis for conflict. Pakistani delegates felt that community-scale pumps would be more appropriate (eg. 50 cm). A Chinese member exclaimed that in China they would never waste the amount of water that is wasted from the RAM pump; rather they would find the source and distribute water effectively from there. Group delegates were curious as to whether the habits of the farmers change in response to the new irrigation management. A general consensus among group members was that the pump irrigation system was not as effective as it could have been and suggested a package deal would be the most effective means. A package deal could include improved variety of crops or establishing aquaculture in the reservoir. Delegates remarked that people in Tajikistan seem to suffer severely from dependency theory, because of the Soviet legacy. A group from Pakistan remarked that there seemed to be a lack of motivation among beneficiaries because they expected benefits to be given to them for no cost.

5.2 Field Trip to Gunt Valley

The Pamir Highway in the Gunt Valley, the first high mountain highway ever constructed, was a major feat completed in 1935. In Segd village, delegates had the opportunity to learn about the structure of community goernance structures. Village organizations (VO) are formed to enable communities to assess, prioritize and implement development projects. VOs are self-governing local institutions that operate democratically. They are guided by a charter and promote and inclusive process. Members are represented by four elected staff: president, deputy, women's group leader and accountant. MSDSP established VOs in order to provide an opportunity for vulnerable, poor and marginalized segments in communities to effectively participate in decision-making. Sub-committees of VOs are specialized to deal with water issues, women's and youth activities and pasture management. Chinese delegates were surprised to learn that members of the village organization are volunteers without benefits from the government.

Photo 2: Siphon irrigation in Segd village, Gunt Valley

As land distribution is contentious, improved irrigation increases winter fodder availablilty and quality. Three siphons visited irrigate over 100 hectares of land which otherwise would have been left idle. Maintenance of the siphon is the responsibility of the village organization.

In Gunt valley, farmers apply for land and the government allocates accordingly. Conflict management over land tenure is mitigated through regular meetings.

Delegates questioned why a siphon was chosen as the most effective means of irrigation, when a water-lifting device could have been intalled along the Gunt River. Generally, there is sufficient land (more than demand), however the severe shortage of able-bodied men for labour tends to be the limiting factor.

In the Jamoat Navobod, a Community Based Savings Group (CBSG) provides security, and diversifies income which can alleviate pressure on the natural environment. The strong presence of NGOs in Gunt valley highlights the trend of NGOs providing support in areas where the government lacks the capacity.

5.3 Transformation in the Pamirs. Cross-sectional profile from Combined Mountain Agriculture and High Mountain Pastoralism to Oasis Cultivation

Travelling along a route of the ancient Silk Road, the field trip followed an appropriate path from an agro-pastoral region, to high mountain pastureland and crossing a high pass on route to the final destination of an oasis.

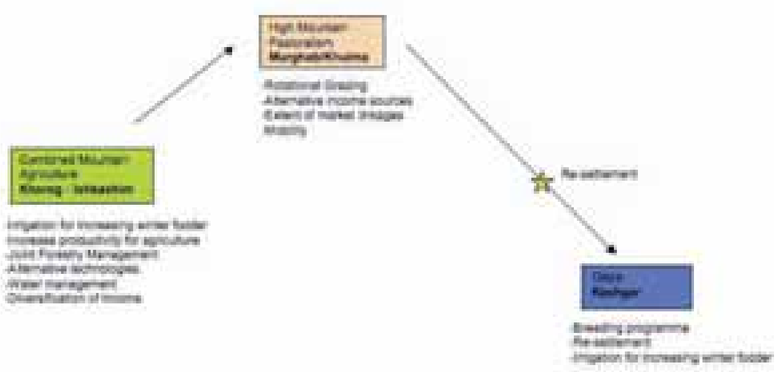
High Mountain
Pastoralism
Rotational Grazing
Alternative income sources
Extent of market linkages
Mobility
Combined Mountain
Agriculture
Khorog - Ishkashim
Irrigation for increasing winter fodder
Increase productivity for agriculture
Joint Forestry Management
Alternative technologies
Water management
Diversification of income
Re-settlement
Oasis
Kashgar
Breeding programme
Re-settlement
Irrigation for increasing winter fodder

Figure 1: Cross border pastoral field trip; travelling from area of combined mountain agriculture to high mountain pastoralism to oasis.

Tajikistan has recently seen a political and economic **transformation** from a planned economy to a privatization. As a consequence, pasture management currently suffers from a lack of state support. Contrarily, Xinjiang is experiencing a drastic transformation from a seminomadic pasture management regime to a government led re-settlement plan.

These polarized transformations bring into question how each of the respective regimes contributes to the **resilience** of pastoral communities. The conference filed trip revealed two extremes; first, the Tajik model which is still suffering from the sudden withdrawal of external inputs with the collapse of the Soviet Union. Distribution and status of pasturland remains unclear due to the absence of any laws on user rights.[57] In contrast, the re-settlement scheme of Xinjiang, which is initiated, controlled and monitored by the State, boasts a strongly regulated central management regime, not unlike the Soviet system in Tajikistan 1970s and 1980s.

The challenge thus becomes how to balance state and community influence, and to identify which stakeholders are most suitable to manage an increasingly complex natural resource management system. The land tenure issue for example in the three regions of interest requires contextual responses from different stakeholders. In Tajikistan for example, the issue of land tenure is unresolved but the government is attempting to pass a law of usage right. Pakistani participants felt that land tenure must be private in order for users to have a sense of ownership. Contrarily, the Chinese model is based on the belief that only if the government owns that land will they be accountable for the sustainable management of the corresponding resources.

Photo 3: Kulma-Pass linking the Eastern Pamirs with the Western Kun Lun Shan (photograph © Hermann Kreutzmann)

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[57] Pasture law is under revision. Supported by the World Bank, the law is not yet in effect.

5.4 Comparison of Pastoral Situation in Tajikistan, Pakistan and China

Situated in similar ecological zones, political circumstance has formed the basis for divergent pasture management regimes in Tajikistan, Pakistan and China. While Tajik pastoralists suffer from severe isolation and a lack of access to markets, Chinese pastoralists have become relatively successful entrepreneurs with the aid of intermediaries, the establishment of cooperatives and a marketing platform in which livestock products are branded. While globalization and modernization have hindered the further growth of pastoralism in Pakistan, where education and media encourage the younger generations to seek professional degrees in urban centres, globalization in Xinjiang can act as an impetus to development. Chinese government officials explained that through improved technology and expertise, Xinjiang has enhanced its competitive edge in order for pastoralism to survive.

The major difference in the pasture management regimes tends to the type of governance; contrary to the participatory management promoted in Tajikistan, Pakistan and Kyrgyzstan, China is taking a highly centralized top-down approach to pasture management. A Pakistani delegate mentioned ownership as an important intervention; however, the Chinese countered this argument with the notion that government ownership is the best way to ensure long-term collective sustainability.

Winter fodder appears to be a common bottleneck in all three regions, with irrigated fodder crops as one management response to this limiting factor. In the context of a changing climate, we can expect water resources in the Pamir and Hindukush-Karakoram-Himalaya mountain regions to increase in the short term and decrease in the long term. Irrigation management should therefore be flexible enough to adapt to drastic changes in water availability.

While degradation of pastureland is a challenge shared by the entire region, the cause of degradation differs, calling for relative and appropriate responses. Despite China being faced with a growing population and a consequently growing demand for ecosystem services (livestock products, secure watershed etc.), a heavy supply of inputs provides necessary support to pastoralists.

The Tajik system has suffered from a drastic cut of inputs with extremely limited financial and/or legislative support from the State. Despite collection of a land tax, the government is unable to provide adequate protection for rangelands. Most notably, the main source of fuel in the Tajik Pamirs is shrubbery, which acts as an important soil stabilizer. The uprooting of the majority of these sub-alpine shrubs, results in expansive desertification. As Tajikistan undergoes a transition process from a planned economy to private ownership, pastoralists who were given livestock after the collapse of the Soviet Union suffer from a lack of know-how and have had trouble reaching remote pastures, leading to the more severe degradation of winter pastures. Compounding this problem, the drastic outflow of labour caused by remittances reduces the potential for productive agriculture.

In Xinjiang, a government-led intensification scheme has been deemed as the appropriate response to increase fodder availability and improve animal health while improving the livelihoods of rural mountainous populations. In the last twenty years, 200 million farmers have moved to urban areas and are no longer self-sufficient. Farmers have increased their incomes by two-thirds as a result of income from non-farm activities; and the government aims to provide pastoralists with the same opportunities. As one Chinese official commented on the resettlement scheme, “progress in lifestyle…not change in lifestyle.”

5.5 Resettlement in Xinjiang Province: A Mitigation and Adaptation Measure to changing Ecological and Social Systems

Pastoralists in Xinjiang province have traditionally adapted to four distinct seasons through migration; moving hundreds of kilometres each year to reach remote summer pastures. Livestock numbers in Xinjiang have increased as a function of increasing production capacity of summer pastures, while it is commonly believed that winter and spring fodder is the main limiting factor to even greater growth.

The importance of pastoralism in Xinjiang is exemplified by its 720 million ha of useable pastureland, and its share of 30 per cent of Xinjiang’s total GDP of 28.9 billion. Of the useable pastureland, up to 30 per cent is degraded, the majority of which is spring and autumn desert-steppe.[58]

Chinese government authorities have identified three major problems with the current pastoral system. First, the quantity and quality of pasture land is decreasing; second, providing essential social services to a nomadic population is challenging; and third, the harsh geological and environmental conditions of Xinjiang province result in a lack of physical infrastructure in remote mountain areas. The National Chinese government has initiated a number of interventions to meet these shortcomings and to mitigate pressure on rangelands. In the 1980s, the government proposed a policy to replace high mountain pastoralism with agropastoralism. Through fencing and rehabilitation (including sowing by airplanes), pest control and controlled removal of non-edible biomass, the policy was effective to a certain extent in mitigation, but did not succeed in providing basic social infrastructure to pastoralists. This limitation led the government to initiate the resettlement programme with view to protect natural pastures and to improve the livelihoods of high mountain pastoralists through their resettlement in lowlands.

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[58] Steppe in China is defined as an area where only five plants/square metre are to be found. In a more general measure steppe refers to frost-affected areas with scanty vegetation cover.

A number of preconditions should be met prior to resettlement: pastoralists must be willing to resettle; the pastoral lifestyle should be respected and altered as little as possible; and the efficiency of the economy should be improved through reduced inputs but greater outputs.

It should be emphasized that the resettlement programme does not mean to abandon the pastoral way of life, but rather, it encourages a shift from 4-season nomadism to 2-season nomadism. Pastoralists will still graze their animals in the high pastures in summer and autumn, but will settle in the valley in the winter and spring, where fodder and veterinary care is provided for the animals and pastoralists have access to social services such as schools and health centres.

Communities contribute to the resettlement process in varying degrees depending on their geographical location and social status. In the poorest areas, communities are only responsible to produce livestock products. Alternatively, in richer areas, the expenses for resettlement are divided among the community, the national and regional governments.

Observations and lessons learned:

The assets of the resettlement programme have been clearly outlined: improved productivity, concentrated management of resources, social benefits, reduced pressure on natural pastures and even carbon sequestration. Nonetheless, there are also valid concerns and limitations to the programme. During initial trials, many herders left the settlements because they did not have the necessary knowledge or skills to adapt to a semi-nomadic way of life. The government must provide training to pastoralists on adaptive methods to raise livestock in communal sheds and provide regular veterinary care.

Delegates from Central Asia compared the resettlement programme to the Soviet resettlement strategy of the 1970s and 1980s, which ultimately failed because of a strong dependence on external inputs from a central source. International delegates were primarily concerned with the loss of indigenous knowledge and culture of pastoralists. As one delegate from Pakistan explained, “Pastoralism in not a management plan; rather, it is a way of life.” Furthermore, the resettlement programme is thought to increase the reliance on the central government. Traditionally, the pastoralists of all societies remain politically independent. One can look to the Kyrgyz of the Wakhan corridor in Afghanistan as a case in point. Through the provision of basic services such as education and health care, the government is may be able to gain control over a fringe population comprised primarily of an ethnic minority group.

Photo 4: The newly-built resettlement village of Bulunkul was visited by the participants. The project managers in charge explained the construction process and the assets of the new township (Photograph July 19, 2010 © Hermann Kreutzmann)

Field visit – Bulunkul Resettlement Village

During the field trip, participants visited the largest resettlement programme in Xinjiang province. With the capacity to accommodate 455 households, the settlement *Bulunkul*, has the capacity to house one third of the total pastoral population of the area.

Each housing unit is composed of three bedrooms, one kitchen, one bathroom and central gas heating. The total government investment per unit is 160,000 Yuan or approximately USD 24,000. Six veterinarians will be provided for the 455 households, 300 kg of grass and 30 kg of fodder will be provided for each head of small livestock. During the winter and spring livestock will be kept in a large common shed as an appendix to the compound.

Herders will move into the settlement free of charge, and are only responsible to produce livestock products (no quotas assigned) and pay utility costs. The first 110 households will move in October 2010.

Conference participants were concerned that the promotion of a sedentary lifestyle will decrease resilience to external economic, political and ecological shock. Mobility is a recognized rangeland management practice, as it allows herders to reach remote pastures and decrease the incidence of overgrazing. The Chinese Director of Animal Husbandry explained that the resettlement programme actually encouraged mobility to summer pastures, and would in fact provide transportation to herder to their summer pastures, contributing to their well-being in harsh mountain conditions.

Another concern raised by conference participants, was the opportunity for a large-scale disaster incurred through the concentration of pastoralists and their livestock. For example, should an epidemic such as foot and mouth disease break out in the area, the results of keeping thousands of livestock in a common area could be devastating. Chinese authorities counter this argument with the logic that with proper and focused veterinary care, the incidence of disease should decrease drastically.

A social concern raised was the possibility that with improved education and opportunities, pastoralism will be abandoned as a source of income by future generations. The major limiting factor to growth of the livestock sector in Pakistan is an unwillingness of younger generations to take up pastoralism as a lifestyle or income source.

Recorded by Jamila Haider

››› 6 Pastoralism in Xinjiang:

Implementing the Pastoralist Settlement Programme to promote Sustainable Development of Pastoralism in Xinjiang

Zhao Xinchun[59]

Xinjiang has been a pastoralist society with many nomadic groups living together since ancient times. The ethnic nomads in this region include the Kazaks, Mongols, Kyrgyz and Tajiks, among others. The nomads have lived on the pastures for generations. The pastures are their home and source of livelihood. Hence, the development of pastoralism is very important for the livelihood, industry and culture of the pastoralists. At present, Xinjiang has 1,164,700 pastoralists living in 275,800 households (Statistics Bureau of Xinjiang 2009).

Xinjiang is endowed with abundant natural pastures, covering a total area of 57 million hectares, with 48 million hectares exploitable (Animal Husbandry Department 1993). The pasture resources are rich and varied. There are flat pastures laid out horizontally and mountainous pastures laid out vertically. Constrained by the climatic and topographical conditions, utilization of seasonal pastures in Xinjiang faces clear limitations. The summer pastures are mainly located in the middle and upper parts of the mountain system, while the spring and autumn pastures in the lower parts of the mountains or in flat areas at the foot of the mountains, and the winter pastures are found in desert-grasslands, plain river valleys and low mountain areas featured by an inverse temperate climate. Over time, a system of alternate seasonal utilization evolved. This gives the animal husbandry industry in Xinjiang pastures a distinct characteristic of seasonal grazing. Pursuing grass and water, the pastoralists carry on a lifestyle of nomadic seasonal grazing.

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[59] Deputy Director & Chief Scientist of Animal Husbandry, the Animal Husbandry Department of Peoples‘ Government of Xinjiang Uigur Autonomous Region.

Pastures in Xinjiang rely entirely on natural precipitation and have no infrastructure. The limited productivity of natural pastures cannot meet the increasing need for fodder for the cattle. Excessive grazing, pasture degradation, ecological deterioration and a number of other issues have become quite acute. Whenever extreme weather conditions such as droughts and blizzards occur, not only do a large number of cattle die, but the pastoralists' basic life necessities cannot be guaranteed. In addition, the majority of the summer and winter pastures are far apart, spanning from dozens to hundreds of kilometres apart. The complex geography, steep slopes, deep valleys, river rapids and extremely difficult road conditions make it quite challenging for human beings and animals to travel between grazing spots.

Plus, the pastoralists are scattered and live within single households. When transferring to the next grazing spot, they have to carry all their possessions on their own backs and shoulders or use big cattle for transport, with few motor vehicles involved. Every year the pastoralists have to rotate between the summer pastures and winter pastures with their family belongings and animals. The long distance travel, fatigue, lack of supplies and lack of communication equipment has made life harsh for pastoralists. In addition, they are being severely constrained by their lack of opportunities to enjoy education, healthcare, shopping and other benefits of modern civilization. Pastoralism in Xinjiang has been plagued by the malicious cycle of livestock being "strong in summer, fat in autumn, skinny in winter and inadequate in spring." Following the available grass and water, seasonal grazing causes major limitations to the development of pastoralism in Xinjiang.

1 Development of pastoralist sedentarization in Xinjiang

To get rid of poverty and underdevelopment in pastoralist communities and transform their traditional production and living patterns, the Party Committee and Government of Xinjiang Autonomous Region have been promoting the strategic deployment of pastoralist settlements since the 1980s, with the purpose of improving living and working conditions for pastoralists and improving fodder and sheds for cattle in cold seasons. The Sedentarization program has taken into full consideration the environmental and lifestyle factors of the region.

To improve the living and working conditions for the pastoralists, we have brought the scattered households to the flat areas from the mountain slopes, providing them with fully-equipped dormitories and necessary production facilities, and hence, providing a better quality and standard of life. To supply livestock with enough fodder and shelter in cold seasons requires building high-standard crop-based fodder pasture in the flat areas where conditions of water, soil, light and heat are appropriate. The irrigated crop-based pastures are expected to satisfy the needs of fodder and grass for cattle. This way the sedentarization of pastoralists can be easier, more stable and generate more income for them. Water is a precondition for cultivating a man-made forage base. Therefore, the pastoralists in Xinjiang follow a mode of sedentarization in which locations are determined based upon water source, grass variety by location, animal variety by grass variety and human settlement by animal variety.

Under the leadership and support of the Party Committees and the People's Government at various levels, different districts in Xinjiang carry out coordinated planning of dormitories, animal sheds, forage bases and infrastructure for water and power supplies for the settlements. A series of favourable policies have been put forward to promote the development of pastoralist settlements. Through efforts of many years, Xinjiang has established a number of workable models such as the village-based concentrated settlements, "flower-arrangement" settlements and mobile settlements. Standards for sedentarization have been institutionalized, including "three accesses" (access to water, road and electricity); "four availabilities" (availability of living quarters, animal sheds, fodder pastures, and fodder/silage storage spaces) and "five complementary facilities" (school, clinic, shopping, cultural centre and technical support service). At the end of 2009, Xinjiang had 106,500 settled pastoralist households, accounting for 38.6% of the total number of pastoralist households. After settlement, the winter mortality rate for livestock has been reduced to 1.5 % from the 10% experienced in the 1990s. The living standards of pastoralists have been constantly increasing, with the per capita income rising from 1,050 Yuan in 1996 to 2,480 Yuan in 2008 (Animal Husbandry Department 2009).

The traditional seasonal pasturing is being changed into a new pattern featuring shed feeding in cold seasons and pasturing in warm seasons. With more machinery involved in the process of moving from one location to another, the living and production methods of pastoralists are witnessing fundamental transformations in this region.

Although the development of pastoralists' sedentarization in Xinjiang has had achievements, there are still some prominent problems. One is slow progress. At present, there are some 169,300 households that are unsettled, posing an arduous task for the government.[60] Second, there has been a lack of investment in infrastructure: the water conservancy projects are stuck in stagnancy. The man-made forage bases face a serious shortage of land resources, with the total reserved area for crop-based fodder pasture at only 3 million mu (with 15 mu equal to 1 ha) or 10 mu per household, hardly satisfying the needs of shed feeding for cattle in cold seasons.

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60 Animal Husbandry Department of Xinjiang Uighur Autonomous Region 2009; Statistics Bureau of Xinjiang Uighur Autonomous Region 2009.

The third problem is sluggish economic growth in the pasture region, with the pastoralists' incomes generally low. In 2008, the per capita income of pastoralists in Xinjiang was 2,480 Yuan, only half of the average income of rural residents in the country.[61] Moreover, the income gap seems to be widening even further. Fourth, more than 70% of all pastures in Xinjiang are over exploited, with more than 80% of all pastures experiencing some degree of degradation and desertification. The loading capacity of rangelands is decreasing and there is an acute conflict between pastures and grazing.

2 Vision for the future

2.1 Stick to the policy of ecological replacement of rangelands

The policy of ecological replacement of rangelands results from long-term practices dedicated to pasture conservation and economic development of grazing areas. It is a key solution to the problem of overgrazing, pasture deterioration and the transformation from the quantity-oriented growth to a quality-oriented one in the animal husbandry industry. Ecological replacement of rangelands is meant to restore the natural regeneration mechanism of natural pastures, to utilize the natural pastures in a sensible manner in terms of timing, quantity and extent, and to realize the sustainable use of natural pastures through utilizing grazing prohibitions, resting, rotation and enhancement. In the meantime, quality and productive man-made forage bases are a must in order to compensate for increasing demands on natural pastures by the development of animal husbandry. Pastoralists' sedentarization should focus on providing shed feeding in cold seasons and pasture grazing in warm seasons.

According to the ecological replacement strategy, Xinjiang has renewed planning for the utilization of more than 700 million *mu* of natural pastures. Among these, 100 million *mu* of seriously degraded spring and fall pastures and winter pastures will have an 8-10-year break. 450 million *mu* of foundational pastures will have reduced grazing and/or rotational grazing among several locations.[62] In the meantime, 10 million *mu* of man-made forage bases will be built in the region. 20 million *mu* of man-made grass fodder land (10 million *mu* as reserved base) is to be saved though the restructuring of crops in the agricultural area and 10 million *mu* of natural hay meadows improved. On this basis, 40 million sheep units will be transferred from pastures to agricultural areas and 30 million more sheep units will adopt shed feeding in cold seasons in the pastoralist communities. This way the ecological system of pastures will be fully restored and the local economy will become healthier and more sustainable.

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[61] All statistics in this paragraph come from the Animal Husbandry Department of Xinjiang Uighur Autonomous Region 2009.

[62] All statistics in this paragraph come from the Animal Husbandry Department of Xinjiang Uighur Autonomous Region 2003.

2.2 To continue to improve the pastoralists sedentarization program

At present, the Chinese Government attaches great importance to the work in pastoralist settlements. The pastoralist and nomad sedentarization program is an important part of infrastructure building in the rural areas. In 2009, the central government allocated 300 million Yuan for the construction of pastoralist dormitories and animal sheds in Xinjiang. The regional government of Xinjiang seized this opportunity to formulate the Implementation Plan of the Xinjiang Pastoralists Sedentarization Program, based on the results of exhaustive research, expert consultation and many revision sessions. The Plan raises clear requirements in terms of strategy, objectives, standards and patterns of construction for the settlements this year. The governments at various levels of the Autonomous Region will continue to uphold the sedentarization standards, promote infrastructure building such as water and electricity supplies, roads, housing, animal sheds, grass fodder pastures, among others, and incorporate the pastoralists sedentarization program into the larger movements of building socialist pastoralism, urbanization and a modern agricultural industry. Emphasis will be put on improving social services to the local communities, reducing urban-rural gaps and raising the living standards of pastoralists.

2.3 To accelerate the development of high-standard man-made fodder and grass pastures

Cultivating high-standard man-made forage bases is the key to realizing the ecological replacement of pastures, and a prerequisite, and guarantee, of the acceleration of pastoralist sedentarization and the transformation of grazing methods.

The regional government has put forward clear goals and measures for accelerating the construction of three 10 million *mu* of forage base projects. Relying on various existing projects, while at once trying to gain central government support, the regional government has aimed for the full-scale ecological replacement of rangelands by initiating the protective utilization of 10 million *mu* of high-quality rangeland, exploitive utilization of 10 million *mu* of man-made grassland and rehabilitative utilization of 10 million *mu* of fodder and grass pastures in the agricultural areas. The methods used include new development, re-development, reclamation and restoration.

In constructing the fodder and grass pasture bases, the commitment of the government at various levels is indispensable. Funding for disaster relief, agricultural development, poverty alleviation and small rural water conservancy projects must be pooled together to support and promote the development of man-made fodder and grass pastures in a consistent and step-by-step manner. Special emphasis should be put on developing high-quality grass crops. The strategic restructuring of agriculture and the rural economy should be combined with the upgrading of crop-based pastoralism. The triad structure of "grain, cash crops and grass" of the cropping industry should be established to promote the integration of agriculture and pastoralism. The regional government has proposed to use the land saved from cotton cultivation for growing corn that will be used for silage to feed animals, corn fodder, clover and other high-quality forage. Focusing on rotational cropping among fields, integrated and alternate cropping, Southern Xinjiang has prioritized wheat, corn and other high-quality fodder crops by tapping into its groundwater resources. Whereas Northern Xinjiang has reformed cultivation modes to explore the possibilities of two crops per year and using other means to stimulate production.

Newly added financial support for the autonomous region in 2008 reached 50 million Yuan, which was expanded to 100 million in 2009 (Communist Party Committee 2007). Of the total funding, more than 40% went to the development of high-quality fodder and grass pasture bases.

2.4 To speed up the water conservancy projects in the pasture region

Xinjiang is an irrigated agricultural area. The key to developing man-made forage pasture is the construction of water conservancy projects in the rangelands. The autonomous region will accelerate the construction of such projects and establish a sustainable water conservation support system in line with the ecological preservation of pastures and economic development.

The region will rely on the pillar water conservation works that are already built or under construction. These strengthen the supplementary water-saving facilities and tap into the potential of existing water resources. In light of conditions for the water and land resources, a series of small- and medium-scale projects will be initiated to serve the development of man-made fodder and grass pasture bases.

2.5 To actively transform the production methods of stock-raising in the pasture region

The autonomous region is taking advantage of the pastoralist sedentarization program to implement the new practices. The old model of year-round grazing is being transformed to a new one featuring grazing during warm seasons for half a year and stable feeding during cold season for the other half. Seasonal pastures are being adjusted to phase out the winter pastures or turn them into better summer or fall pastures, if the conditions are right. The area and load capacity for pastures of warmer seasons are being expanded to increase grass and animal counts. In the meantime, the autonomous region is also taking measures to involve more machinery in the relocation of herdsmen, improving the living and working conditions of pastoralists, increasing the mechanization of the animal husbandry industry and modernizing the process of relocation.

2.6 To increase labour mobility in the pasture region

To increase labour mobility in the pastoralists' communities, several things must be done well. First, various awareness and publicity campaigns should be carried out to change the mindset of pastoralists. Second, technical training for pastoralists should be promoted on a larger scale and the problems faced regarding trainers, facilities and funding must be resolved. A proper training system should be established to institutionalize and regulate the training of pastoralists. The focus should be on modern thinking, management expertise and applied technology to enhance the technical, employment and entrepreneurial skills of the pastoralists. This way, their opportunities for employment and income will be expanded along with their ability to survive, do business and secure employment. Third, pastoralists should be given guidance in order to develop niche industries, such as arts and crafts catering to folk and cultural tourism, transportation, cultural events and other sectors of the second and third industries. The goal is for one third of the pastoralists to engage in animal husbandry, one third in agriculture and one third to relocate to the second and tertiary industries in cities and towns.

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››› 7 Recommendations for improved Rangeland Management in the Context of a Changing Climate

Based on theory, field observation and a dynamic exchange of ideas, delegates from China, Pakistan, Tajikistan, Kygryzstan, Mongolia, Nepal, Canada, Switzerland and Germany proposed a set of recommendations for pasture management and specifically for cross border cooperation in the Pamir mountain region.

Recommendations for cooperation proposed by the Chinese delegation

Government	1.	Policies to facilitate CB cooperation
	2.	Increase output
	3.	Joint systems to protect against disasters
	4.	Government design strategies to protect traditional methods
	5.	Neighbouring countries should establish an information sharing platform for pastoralism
	6.	Study models, evaluate and assess the pros and cons
	7.	Import/export of fine breeds
	8.	Increase pastoralists involvement in decision-making in the programme design stage
	9.	Cross border survey of pasture resources
	10.	Pastoralists should cross borders and practice nomadism to achieve maximum utilization of natural resources
	11.	Herder's Cooperation (each consists of 30–50 HH)
	12.	Specific planning for establishing cultivated pasture
	13.	Government should provide sufficient research
	14.	International/regional cooperation agreements
	15.	Specific planning for establishing cultivated pasture
	16.	Epidemic disease control programme (internal)
	17.	Animal disease monitoring (CB mechanism) China is already doing this, other countries should as well
	18.	Government provides infrastructure and services
	19.	Government subsidizes sector over long period of time
	20.	Electronic trading information for animal products (cell phone network)
	21.	Tax incentives; tax reduction for pastoralists across borders
	22.	Create incentives for pastoralists to decrease number of animals, grazing ban etc.

Research & Capacity Building	1.	International research teams (pasture condition, and processing and marketing of products
	2.	Research Institutions should provide policy recommendations to government
	3.	Cross border field trips including government officials
	4.	Research and protect the gene pool (fodder species, livestock) to protect endangered species
	5.	Joint research on pasture resources
	6.	Breeding technology
	7.	Disease control technology
	8.	Participatory management by pastoralists
	9.	Institutes should design and publish herder's Manual (outreach, monitor, extension services).
	10.	Research on pastoral development models
	11.	Pilot projects and case studies
NGO	1.	Help Government conduct services which might be inconvenient for government to provide (eg. not available in certain areas)
	2.	Establish herder's association
	3.	Provide technical services (processing and disease control)
	4.	Strengthen cooperation with international NGOs
	5.	Be involved in capacity building so that pastoralists can be more sustainable
Other	1.	Electronic platform for trading information
	2.	Import/Export of fine breeds
	3.	Cross border trade

Trend that most work happens within government and research institutions

Recommendations for cooperation proposed by the Tajik delegation

Government	Budget for pastoralism	Formulate policy • laws • strategy • action plan • classification of pasture, access and taxation	Coordination of stakeholders • policy • dialogue • implementation	Disease control and veterinary services	X	X	X	X
Research and capacity building	-	X		X	Pasture Management -maps -duration -rotation -monitoring -development	Training in Pasture Management	X	-
Development agencies	X	X	X	X		X	X	X
NGOs	X	X	X	X	X	X	Increase winter fodder production -irrigation -new varieties	X
Private sector	-	X	-	X	-	-	-	Processing and marketing of livestock products

Options for Further Cooperation

- Knowledge and information sharing
- Herder's manual for pasture management (University of Central Asia> Kyrgyzstan and Tajikistan)
- Pastoral information system (from newspaper towards a rural information system) for Kyrgyzstan and Tajikistan
- Learning from the pasture legislation recently developed in Kyrgyzstan, collaboration between Tajikistan and Kyrgyzstan for best practices
- Lack of baseline data in Central Asia
- *Common Central Asia Mountain Monitoring Network* (centrally stored data)
- Development of curricula for pasture management to create local expertise (Himalayan Universities consortium)
- Exchange of expertise and training (e.g. UCA, ICIMOD, FAO)
- Explore use of pastures/rangeland for carbon sequestration (no methodology has been developed to make this land available for carbon sequestration funds)

Recommendations for cooperation proposed by the Pakistan delegation

Government	Finalize rangeland policy/law at federal level
	Ensure communal access to pasture
	Formulate action plan for provincial implementation level
	Develop innovative financing/implementation mechanisms for action plan which may include incentives or payments for environmental services
Research and Capacity Building	Initiate inter-sectoral dialogue among different line ministries (eg. high level workshop)
	Adaptive research on carrying capacity/stocking (Baseline and milestone)
	Research on alternative/complementary sources of income
	Spatial land-use planning
	Agro-ecological zoning
	Initiate rangeland department within Karakoram International University (KIU) (for research and training)
Projects + Programmes	Initiate rangeland improvement programme (GOs and NGOs) with a focus on restoration, management and sustainable use of rangelands
	Establish better mobile services such as for human and animal health and education
NGO/Private Sector	Provide a platform for pastoralists to voice their views, opinions and concerns and articulate their investments
	Strengthen value chain of livestock production (market linkages)

››› 8 Assessment of Workshop and Closing Remarks

Hermann Kreutzmann

The selection of Khorog and Kashgar as venues has proved successful for a regional workshop on pastoralism and rangeland management that has aimed at presenting a wide spectrum of different approaches and experiences focusing on mutual challenges in specific fields that are related to animal husbandry in the context of climate and global change.

The workshop participants aimed at contributing to four thematic fields that might be briefly recollected and assessed.

1. Analysing the complexities of pastoralism and rangeland management in varying frameworks of the respective participating nation states.

   The prime objective of the workshop was to get a deeper understanding of the role that pastoralism plays in the context of transformation and modernization. These are the two keywords that basically relate to universal concepts. Nevertheless both have found different expressions and meanings in the participating countries.

(i) Transformation is the attribute of processes in post-Soviet societies. In a Central Asian setting such as Kyrgyzstan and Tajikistan transformation refers to a fundamental shift in property rights regarding agricultural resources, pastures and rangelands. The shift from state-owned property to prevalent leasehold schemes is the vivid expression of this process. At the same time transformation has affected all other state-related institutions, the organisation of exchange relations, marketing and access to common resources.

(ii) Modernisation has been the driving force for social change in most societies to date. Subsistence-oriented strategies have been gradually and systematically been replaced by market-bound exchange relations. Increased inputs for output-oriented strategies that enhance yields are affecting the market economy. The PR of China is a good case in point for the adoption of a modernisation strategy in recent decades. Modernisation increases the division of labour in all sectors including the pastoral systems and rangeland management.

The common ground of both strategies is the economic and societal transition process aiming at the improvement of living conditions in pastoral communities. The major questions refer to who is paying the price and who is carrying the burden of change? Does this lead in the context of pastoralism and rangeland management to more resilient pastoralists?

During the deliberations of our workshop it became obvious that external support is required to foster the process of social change. In addition to the socio-economic viewpoint a second perspective gained equal importance. Pastoralists fulfil an ecological function as landscape managers that should not be neglected or downsized. The protection and maintenance of our common cultural and natural environment has been entrusted to pastoral communities that have proved for centuries to use it in a sustainable manner. Thus, pastoralism has proved to be a complex system and the discussions during our workshop have contributed valuable insights to this continuing debate.

2. InWEnt's concept and idea to convene academics, practitioners and decision-makers during one conference and in different working groups was prominently implemented during this regional workshop staged in two venues. Khorog and Kashgar fitted well into the series of conferences and workshops in the framework of its mountain development programme. As some familiar faces are participating here who have been present on other occasions with varying topics it seems that InWEnt was able to form a community of exchange and learning. Especially during this workshop a sizeable number of InWEnt's alumni from the International Leadership Training (ILT) have been present.
3. This regional workshop was organised with great zeal in Tajikistan and PR of China. It has expressed the flavour and fragrance of each country. Commonalities and differences are the spices of cross-border cooperation. During the three parts of the conference we gained substantial insights that contribute to our understanding of the complex system of pastoralism and rangeland management. Khorog as the first venue provided a welcome starting point for exposure to an area that has been exposed to two major transformations within one century. The people have proved to be resilient and have continued to utilise pastoral resources and to manage the Pamirian rangelands. The complex approaches and follow-up challenges of a transformation process could be experienced during our fieldtrips within

Gorno-Badakhshan as well as during the traverse across Kulma Pass to our second venue in China. The contrast of Murghab District and Kizil Su Autonomous District was instrumental in order to understand varying concepts of transformation and modernisation directed towards pastoral communities, different forms of state intervention and provision of welfare, cross-border exchange between neighbouring countries and commonalities of ecological assets and cultural traits. The personal exposure to high-altitude habitats formed a challenge to most participants and contributed to an enhanced set of fieldwork experience. The venue in Kashgar allowed space to reflect on the experiences made to date, provided valuable background information on aims and targets in the pastoral modernisation process, and gave all participants the opportunity to contribute to the recommendations made by the regional workshop on the basis of professional experience, discussions and recent insights.

4. It is my conviction that this regional workshop will contribute to the overall aim of InWEnt's mountain development programme, that it will stimulate further activities in bilateral and multilateral cooperation. The topics of this workshop pose a vital challenge for the future. Pastoralism and rangeland management have been the topic for the so-called western conference in Khorog and Kashgar. It will be augmented with the follow-up eastern conference in Lhasa in autumn. The Kun Lun Shan, the Pamirs, Hindukush, Karakoram, the Himalayas and the Tibetan Plateau are of central importance for the study of pastoral practices, transformation and modernisation processes of our time in pastures and rangelands. Development practice, regional planning and the implementation of concepts designed by influential decision-makers significantly affect the living conditions of pastoralists in remote high mountain habitats and the future of the rangelands in general.

My special gratitude is directed to the two chairmen Kishwar Abdulalishoev (General Manager MSDSP) and Prof. Dai (Vice-President XAAS) and their respective teams that made this regional workshop successful. I would like to thank our hosts in Tajikistan and China for the perfect organisation of the workshop and the insightful fieldtrips.

Let me thank all country delegates and participants for their valuable contributions during the workshop deliberations and active participation in the working groups. I wish all participants a safe journey home and hope that we soon get another chance to meet in the near future.

9 Annexes

9.1 Conference and Fieldwork Programme

Monday, July 12th, 2010

Arrival of international participants
Registration

Tuesday, July 13th, 2010

Travel of international participants to Khorog

Wednesday, July 14th, 2010

08:30 Pick up of guests by MSDSP from the guesthouses.
Workshop registration at Serena Inn

Opening Ceremony

09:30 Official Opening by
HE Isror Isrorov, Deputy Governor GBAO
Welcome Address by InWEnt
Prof. Dr. Hermann Kreutzmann, ZELF Berlin
Welcome Address by MSDSP
Kishwar Abdulalishoev, General Manager

10:00 Outline of objectives and programme
Kishwar Abdulalishoev, Chairman

10:15 Group Picture and Coffee Break

11:00 Keynote
Climate Change in Mountain Areas
Dr. Madhav Karki, Deputy Director General ICIMOD

11:30 Keynote
Pastoralism in Central Asian Mountain Regions
Prof. Dr. Hermann Kreutzmann, ZELF Berlin

12:00 Panel Discussion
Current Situation of Pastoralism, Rangeland Management and Climate Change in Central Asian Mountain Areas
Panel members:
Kishwar Abdulalishoev, Tajikistan
Ji Hongliang, China
Yodgor Qonunov, Tajikistan
Muhammad Ismail Zafar, Pakistan
Dr. Madhav Karki, Nepal

13:00 Lunch Break

14:30 Group Work
Assessment of Current Situation in Different Settings (TJ/KG, PK, CN)

16:30 Coffee Break

17:00 Presentation of Group Work Results

18:00 Closure

19:00 Reception

Thursday, July 15th, 2010

09:30 Orientation on the day
Kishwar Abdulalishoev, Chairman

09:45 Policies for Mitigating Effects of Climate Change
Dr. Daniel Maselli, Associate Senior Research Fellow, UCA/CDE/SDC

10:15 Recent Changes in Pastoral Systems: Case Study Tajikistan
Yodgor Qonunov, Inspection Unit Manager, Khorog Hukumat, Gorno-Badakhshan

10:35 Recent Changes in Pastoral Systems: Case Study Kyrgyzstan
Prof. Dr. Ermek Baibagushev, Associate Professor of Department for Natural Sciences

10:55 Coffee Break

11:25 Recent Changes in Pastoral Systems: Case Study Xinjiang, PR China
Lu Zhaohui, Project Manager, XAAS

11:45 Recent Changes in Pastoral Systems: Case Study Pakistan
Amin Beg, Programme Manager Policy Dialogue and Partnership, AKRSP

12:05 New Opportunities for Improving Livelihoods through Marketing of Livestock Products in the Alay and Pamirs of Kyrgyzstan and Tajikistan: High Value Cashmere from Indigenous Goats
Dr. Carol Kerven, Research and Consultancy on Livestock Systems in Semi-Arid Areas, Odessa Centre

12:25 Plenary Discussion

13:00 Closure of the Workshop and Lunch

Thursday, July 15th

Exposure to GTZ Projects

13:30 Departure to Barvoz (Roshtkala district) from Serena Inn (Group 1)
Departure to Tusion (Roshtkala district) from Serena Inn (Group 2)

Group Nº1

13:30 Departure to Barvoz (Roshtkala district) from Serena Inn

15:00 Historical background and introduction to Joint Forestry Management (JFM) in GBAO
Overview of the project area from a viewpoint in Barvoz

15:30 Visit of different forest plots leased to tenants in Barvoz
Explanation of the JFM approach and its implementation in the field

16:00 Coffee break in the forest and discussion

16:30 Departure to Khorog

18:00 Arrival in Khorog

Group Nº2

13:30 Departure to Tusion (Roshtkala district) from Serena Inn

14:20 Introduction to water management challenges in GBAO
Demonstration of different water pump technologies and water storage systems

15:15 Drive from Tusion to Tavdem (Roshtkala district)

15:30 Introduction to energy consumption and challenges in GBAO
Viewing of a thermally insulated house, demonstration of energy efficient stove technologies

17:00 Coffee break and discussion

17:30 Departure to Khorog

18:00 Arrival in Khorog

Friday, July 16th, 2010

08:30 Participation at the opening ceremony of the **‘Roof of the world festival’**

12:00 Lunch at Khorog Teahouse

Exposure to MSDSP Projects

13:30 **Travel to Shugnan district (Gunt Valley)**

13:40 Welcome at the entry door to Shugnan district

14:00 Exposure to a Siphon irrigation project in Sizd, Navobod sub-district

14:30 Visit CBSG group "Barakati bonuvon" in Sizd, Navobod sub-district

15:00 Siphon irrigation for development of new lands and forestry in Bohot, Navobod sub-district

15:30 Siphon irrigation for development of new lands and forestry in Dehmiyona, Ver sub-district

16:00 Siphon irrigation for development of new lands and forestry in Shitam village, Ver sub-district

16:30 Exposure to typical pasture in Shugnan, Patkhur village,Vanqala sub-district

17:00 Exposure to a project ‘Seedign of perennial grasses’ , Imom village, Vanqala sub-district

18:00 Dinner, Imom Village Organization

19:30 Return to Khorog

Saturday, July 17th, 2010

08:00 **Travel to Ishkashim district**

09:00 Arrival in Garmchashma eco-cultural village and exposure to eco-cultural activities and hot-spring

12:00 Lunch

13:30 Travel to Pitup eco-cultural tourism village

15:30 Arrival in Pitup and exposure to historical heritage. Hot-spring

18:00 Dinner and Overnight Stay

Sunday, July 18th, 2010

08:00 **Travel to Murghab district**

10:00 Arrival in Bulunkul village, Alichur sub-district

10:15 Exposure to pasture and land use practices

12:00 Lunch

13:30 Travel to Alichur sub-district centre and exposure to pasture and land use practices

15:30 Arrival at the Yurt Camp (20 km from Alichur sub-district centre): Free time

18:00 Dinner and Overnight stay in yurt camp

Monday, July 19th, 2010

07:00 Travel to Kashgar, Xinjiang

Visit and Themes

- Pastoral communities and economic opportunities in PR China
- Irrigation of pastures, adaptation to water availability changes

Stop at Karakul Lake

- Interaction with local herdsmen

Tuesday, July 20th, 2010

09:30 Opening
Introduction to third part of workshop
Prof. Dai, Chairman (Vice President XAAS)

10:00 Group Work
Assessment of Change Processes and Trends observed during Field Visit

12:00 Coffee Break

12:30	Presentation of Group Work Results
13:30	Lunch Break
15:00	**Field Trip** Visit of Aqto Livestock Authority
	Dinner

Wednesday, July 21st, 2010

09:30	Orientation on the day Prof. Dai, Chairman (Vice President XAAS)
09:45	Trends and Tendencies in Pastoral Systems in Xinjiang Zhao Xinchun, Chief Scientist of Animal Husbandry
10:15	Coffee Break
10:45	Group Work Recommendations to support Pastoral Livelihoods and Corresponding Activities
13:00	Lunch Break
14:30	Presentation of Group Results
15:30	Evaluation of Workshop and Closing Remarks Prof. Dr. Hermann Kreutzmann, ZELF Berlin
19:00	Formal Dinner with Local Governmental Representatives/Officials

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